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Volume 41 Number 4 December 2019

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Contents

Research to Practice Review

Research to Practice: Promoting Academic and Social Behaviors in a Small Group 279
Justin D. Lane and Collin Shepley

Research Articles

Factor Structure and Psychometric Properties of the Child Oral and Motor Proficiency Scale 283
Jinhee Park, Britt Frisk Pados, Suzanne M. Thoyre, Hayley H. Estrem, and Cara McComish

Parent-Implemented Communication Strategies During Storybook Reading 300
Yusuf Akamoglu and Hedda Meadan

Recording Support Measures in the Sequential Pedagogical Documents of Children With Special Education Needs 321
Noora Heiskanen, Maarit Alasuutari, and Tanja Vehkakoski

A Systematic Review of Phonological Awareness Interventions for Latino Children in Early and Primary Grades 340
Xigrid Soto, Arnold Olszewski, and Howard Goldstein

Quantity and Quality of Parental Utterances and Responses to Children With Hearing Loss Prior to Cochlear Implant 366
Pumpki L. Su and Megan Y. Roberts

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Research to Practice: Promoting Academic and Social Behaviors in a Small Group

Justin D. Lane[1] and Collin Shepley[1]

Teachers are responsible for providing opportunities for children to learn, succeed, and grow academically and socially. Small group instruction is one effective option for encouraging academic and social skills in young children. For example, young children often display difficulties sitting and listening to a teacher or waiting for peers to take a turn, but these behaviors are often highly valued by kindergarten teachers. Small group instruction prepares children for elementary school and later grades, specifically by teaching children how to learn. Urlacher, Wolery, and Ledford (2016) found that preschoolers with and without special needs could learn to name sight words and practice social skills (make a comment to a peer) during the same brief sessions (10 min each). Children participated in these sessions in the classrooms while sitting at a table, on the floor, or on the playground. Three children participated in each session, and each child learned two different sight words. Once a child learned to name his or her two sight words, the teacher taught two more sight words to him or her. Having each child receive instruction on different sight words allowed all children opportunities to learn the sight words being taught to their peers. Thus, children learned new words simply by observing their peer learn to name sight words.

During instruction, the teacher provided each child six opportunities to name sight words: three opportunities per sight word and 18 total opportunities per session. To teach the children how to name the sight words, the instructor used a progressive time delay (PTD; see Collins, 2012) response prompting procedure. For each opportunity, the teacher presented a sight word on a flashcard and asked, "What's that word?" For the first two sessions, the teacher immediately showed each child how to be correct by asking the question and immediately providing the correct answer (also known as a *response prompt*). After those two sessions, the teacher increased the amount of time between the question and prompt by 1 s. As children responded correctly with or without help, the teacher again increased the amount of time between the question and prompt, waiting 2 s before providing the correct answer and then 3 s, until finally stopping at 4 s. This slow increase allowed children time to learn to respond correctly when the teacher presented a sight word.

To teach social skills, Urlacher and colleagues taught peers with typical development to make comments to other peers in the group when they received a token for a correct academic answer (e.g., "Wow, that's cool!"). The teacher also taught the peers to respond to comments made by other peers during instruction. Correct responses referred to anytime a child named the sight word without assistance or waited and then named the sight word when the

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teacher provided the correct answer. Before each small group session began, the teacher reminded children with typical development to comment to peers and respond to comments. When young children with disabilities had multiple opportunities to watch their peers comment, they often started commenting too.

Given that young children with disabilities may require many opportunities to learn social skills, teachers can begin by instructing children how and when to use these behaviors in a small group. Teachers can provide extra support at other times of the day if they do not observe changes in the children's social skills. The study by Urlacher and colleagues highlights the importance of planning for and including small group instruction as a part of the day, to promote not only academic skills but also social skills. Although small group instruction is less common in preschools, such sessions can occur for brief time periods once a day, allowing children ample time to play and explore with peers. Teachers who include brief small group sessions during the day are investing in children's future by promoting behaviors that lead to success across the life span.

Targeting Academic and Social Skills During Small Group Instruction

Sample Data Sheet

Target behaviors. When presented with a sight word in isolation and a task direction, the child will independently label the word within 4 s.

When presented with a token or a comment from a peer, the child will independently look at a peer and comment to peer about the token or respond to peer's comment within 4 s.

I = Independent
P = Prompted
E = Error

Procedure: PTD
Session #: ___ Time-delay: _____

Trial	Child	Target	Academic Response	Initiate Comment (✓ or −)	Respond to Comment (✓ or −)		
					Ella	*Gabe*	*Tran*
1	*Gabe*	Up	I P E				
2	*Tran*	Crayon	I P E				
3	*Ella*	On	I P E				
4	*Gabe*	Yellow	I P E				
5	*Ella*	Blue	I P E				
6	*Gabe*	Up	I P E				
7	*Tran*	Juice	I P E				
8	*Ella*	Blue	I P E				
9	*Tran*	Juice	I P E				
10	*Gabe*	Yellow	I P E				
11	*Ella*	On	I P E				
12	*Tran*	Crayon	I P E				

	% Independent Sight Words	% Independent Initiations (Comments)	% Independent Responses (Comments)
Ella			
Gabe			
Tran			

Notes:
Time-delay for next session: _____

Sample Completed Data Sheet

Target behaviors. When presented with a sight word in isolation and a task direction, the child will independently label the word within 4 s.

When presented with a token or a comment from a peer, the child will independently look at a peer and comment to peer about the token or respond to peer's comment within 4 s.

I = Independent
P = Prompted
E = Error

Procedure: PTD
Session #: 5 **Time-delay**: 2 seconds

Trial	**Child**	**Target**	**Academic** Response	**Initiate Comment** (✓ or –)	**Respond to Comment** (✓ or –)		
					Ella	*Gabe*	*Tran*
1	*Gabe*	Up	~~I~~ P E	✓	✓		–
2	*Tran*	Crayon	I ~~P~~ E	–			
3	*Ella*	On	~~I~~ P E	✓		✓	–
4	*Gabe*	Yellow	I ~~P~~ E	–			
5	*Ella*	Blue	I ~~P~~ E	✓		–	–
6	*Gabe*	Up	~~I~~ P E	–			
7	*Tran*	Juice	I P ~~E~~				
8	*Ella*	Blue	I ~~P~~ E	✓		✓	–
9	*Tran*	Juice	I P ~~E~~				
10	*Gabe*	Yellow	~~I~~ P E	–			
11	*Ella*	On	I ~~P~~ E	✓		✓	✓
12	*Tran*	Crayon	~~I~~ P E	–			

	% Independent Sight Words	% Independent Initiations Comments	% Independent Responses Comments
Ella	25%	100%	17% (6 opportunities)
Gabe	75%	25%	50% (6 opportunities)
Tran	25%	0% (2 opportunities)	12.5% (8 opportunities)

Notes: All children enjoyed the session; Ella and Tran continued to play together at the dramatic play center.
Time-delay for next session: 2 seconds.

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Factor Structure and Psychometric Properties of the Child Oral and Motor Proficiency Scale

Jinhee Park[1], Britt Frisk Pados[1], Suzanne M. Thoyre[2], Hayley H. Estrem[3], and Cara McComish[2]

Abstract

The purpose of this study was to identify the factor structure of the Child Oral and Motor Proficiency Scale (ChOMPS) and to evaluate the psychometric properties, including internal consistency reliability, test–retest reliability, and construct validity as measured by convergent and known-groups validity. Principal component analysis with varimax rotation conducted on responses from 364 parents of children between 6 months and 7 years of age identified four subscales: complex movement patterns, basic movement patterns, oral-motor coordination, and fundamental oral-motor skills. Acceptable internal consistency reliability (Cronbach's $\alpha = .97$) and test–retest reliability ($r = .98$) were found. Convergent and known-groups validity were supported by significant associations between the ChOMPS and validation measures, as well as significant differences in the ChOMPS scores between children with and without feeding problems. The ChOMPS is a 63-item parent-report measure of eating, drinking, and related motor skills in children aged 6 months to 7 years with evidence of reliability and validity.

Keywords

feeding problems, feeding difficulties, feeding skills, measurement, psychometric

Introduction

Safe, successful, and efficient eating is a critical survival skill learned during early childhood. Shortly after birth, an infant must establish sufficient eating skills to obtain the nutrition and hydration necessary for survival. As infants develop into young children, eating skills increase in complexity along with evolving changes in anatomy, motor development, and nutritional demands (Sheppard, 2008). Eating skills are developed through practice and exposure to increasingly challenging feeding tasks over the first few years of life (Sheppard, 2008). Although most children are seemingly capable of eating with instinctive ease, the development of eating skills and behaviors are influenced by complex interactions between biomedical, physiological, psychological, socioeconomic, cultural, and environmental factors (Berlin, Davies, Lobato, & Silverman, 2009).

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Given the complexity of eating, feeding problems are common in early childhood. Approximately 25% of children who are developing typically (Mascola, Bryson, & Agras, 2010; Wright, Parkinson, Shipton, & Drewett, 2007) and up to 80% of children with developmental disabilities (Benfer et al., 2013; Dobbelsteyn, Peacocke, Blake, Crist, & Rashid, 2008; Gal, Hardal-Nasser, & Engel-Yeger, 2011) have been reported to experience difficulty with feeding. In addition, the number of infants and children who are at risk of feeding problems is increasing due to improved survival of infants and children with a history of extreme prematurity and complex medical conditions (Burns et al., 2010; Hoogewerf et al., 2017; Stoll et al., 2015), although definitive statistics are not available. Pediatric feeding problems can be associated with a variety of negative health outcomes, including severe weight loss, malnutrition, and impaired cognitive, physical, and social–emotional growth and development (Crapnell et al., 2013; Hemmi, Wolke, & Schneider, 2011; Marshall, Hill, Ziviani, Ware, & Dodrill, 2016).

For the purposes of this article, a feeding problem is defined as when "a child is unable or unwilling to safely eat and/or drink enough volume or variety by mouth, despite the availability of food, to obtain the nutrition and hydration necessary for adequate growth and development" (Pados, Thoyre, Park, Estrem, & McComish, in press). Feeding problems may result from delays or deficits in the development of eating skills, from inappropriate or maladaptive feeding behaviors, or from a combination of these factors (Berlin et al., 2009). In many cases, delays or deficits in eating skills and problematic feeding behaviors are intertwined, particularly in young children who are limited in their ability to communicate verbally. For example, an 18-month-old who is having difficulty with chewing does not have words to say "I can't chew and when I swallow food that is not chewed, it hurts." Instead, children may display distress related to chewing by either refusing foods that need to be chewed or pocketing food in their cheek. Although these problems are often intertwined, the distinction between an eating skill (i.e., what a child *can* eat) and feeding behavior (i.e., what a child *is willing to* eat) is critical because to have the best outcome, treatment must be aimed at the correct underlying problem.

Eating skill development occurs as the child reaches developmental milestones that are specifically related to stages of adaptations in feeding style and dietary intake (Sheppard, 2008). The milestones are generally defined by transitions between types of foods (e.g., liquids to solid foods to solids with diverse textures), types of utensils (e.g., bottles to cups or spoons or forks), and independence in eating (e.g., being fed by caregiver to self-feeding; Sheppard, 2008). The acquisition of eating skill milestones can be delayed or altered for several reasons, including anatomic anomalies (e.g., cleft palate), motor impairment (e.g., inability to self-feed due to spastic upper extremities), and limited exposure to eating experiences due to physiologic limitations (e.g., cardiorespiratory disease), medical conditions (e.g., severe food allergies with a limited diet of elemental formula) or sensory impairment (e.g., refusal of solid foods due to hypersensitivity to texture). Therefore, the systematic assessment of eating skills is critical for early identification and treatment of infants and young children with delayed or altered eating skill development. In particular, the first 2 years of life are considered a period of optimum brain plasticity for typically developing children; therefore, children in this period have a greater learning potential and are more flexible in skill acquisition than when they are older (Cai, Chan, Yan, & Peng, 2014; Piek, 2006). Early identification of children and implementation of treatment within this time of brain plasticity may help prevent the development of chronic feeding problems, which can be difficult to change, and require long-term and specialized intervention or treatments.

The Child Oral and Motor Proficiency Scale (ChOMPS) is a parent-report measure of eating, drinking, and related motor skills in infants and young children between 6 months and 7 years old (Pados, Thoyre, & Park, 2018). The ChOMPS was developed to measure observable eating skills (what a child can or cannot do), while the complementary assessment, the Pediatric Eating Assessment Tool (PediEAT), was developed to measure behaviors that represent symptoms of feeding problems (Thoyre et al., 2014; Thoyre, Pados, Park, Estrem, & McComish, 2018). Both

eating skills (ChOMPS) and symptoms of feeding problems (PediEAT) are observable by parents but are measured on different scales. The ChOMPS measures the child's ability to complete a skill, with the options of (a) yes, the skill can be completed consistently, (b) the skill can sometimes be completed, but the child is not yet consistently successful at the skill, or (c) no, the skill cannot yet be completed. The PediEAT measures the frequency or severity of symptoms of feeding problems on a scale from always (i.e., the child always displays the symptom) to never (i.e., the child never displays the symptom).

In earlier studies, we found that parents often differentiated what their children could do from what they were willing to do (Thoyre et al., 2014). For example, the ChOMPS item "My child can move jaw up and down to chew" measures the child's ability (skill) to move their jaw for the motion needed for chewing. This is differentiated from the PediEAT item "My child will eat foods that need to be chewed," which measures the child's willingness to eat complex foods that require chewing, which could be a symptom of problematic feeding if observed rarely in a child of an age at which chewing would be expected. Separating the report of symptoms of problematic feeding behavior from the report of observations of eating skill allows for a clearer assessment of how these separate factors contribute to the child's eating so that interventions may be targeted appropriately. Interventions would be targeted differently, for example, for the child with a history of long-term gastric tube feeding related to esophageal atresia who has poor motor control of the jaw from lack of use as compared with the child with autism spectrum disorder with full ability to move the jaw up and down for chewing, but who refuses to eat foods that require chewing due to sensitivity to texture.

The purpose of this study was to identify the factor structure of the ChOMPS and test its psychometric properties, including internal consistency reliability, test–retest reliability, and convergent and known-groups validity.

Method

Sample and Recruitment

The target sample in this study was parents or caregivers (hereafter referred to as *parents*) of children with and without feeding problems who met the following inclusion criteria: (a) 18 years of age or older, (b) caring for a 6-month to 7-year-old child who was being offered at least some solid foods, (c) literate in English, and (d) Internet access. Quota sampling was used to ensure a similar distribution of the sample across 11 age categories between 6 months and 7 years based on the American Academy of Pediatrics (AAP) periodicity schedule (Geoffrey et al., 2014) and child gender. In addition, given the expected wider range in variability of eating skills in children with feeding problems, we purposely oversampled parents of children with feeding problems for a thorough representation of problematic eating skills.

Given the need for a large sample size, eligible parents were recruited from a variety of sources. The recruitment sites included several online parent support groups in North Carolina and Massachusetts; *The Feeding Challenges Registry*, our research team's international registry of parents of children with feeding problems; a feeding specialty clinic in North Carolina; *ResearchMatch*, a national health volunteer registry supported by the U.S. National Institutes of Health as part of the Clinical and Translational Science Awards (CTSA) program; *Join the Conquest*, a research registry of community volunteers that was created by the North Carolina Translational & Clinical Sciences Institute (NC TraCS) and supported by the National Institutes of Health through the CTSA program; and an informational email sent to staff, students, and faculty at the University of North Carolina at Chapel Hill. The institutional review boards of both the University of North Carolina at Chapel Hill and Boston College approved the study.

Sample Size

Varying guidelines exist for determining the appropriate sample size for factor analysis. Most authors recommend five to 10 subjects per item, but also note that the ratio of subjects to items can be diminished as the sample size increases (DeVellis, 2012). Tinsley and Tinsley (1987) recommend a ratio of five to 10 subjects per item up to a sample of 300, at which point the ratio can be reduced. Given that the ChOMPS had 70 items, we aimed to sample more than 350 parents to meet the minimum criterion of five subjects per item (Tinsley & Tinsley, 1987). This sample size is in the range of good to very good for factor analysis (Comrey & Lee, 1992).

Measures

Preliminary version of the ChOMPS. The ChOMPS was developed to measure eating, drinking, and related skills in infants and young children between 6 months and 7 years of age who are being offered solid foods. The ChOMPS was developed using Dynamic Systems Theory as a theoretical framework (Thelen, 2005), which guided us to take a holistic approach to eating skill assessment and include all motor skills that are supportive of eating in a safe, efficient, and age-appropriate way (Pados, Thoyre, Park, Estrem, & McComish, in press). The ChOMPS was developed following DeVellis's instrument development guidelines (DeVellis, 2012). The development and content validation of the ChOMPS is described briefly here, but additional details are available in Pados et al. (in press).

Items were generated through literature review, secondary analyses of interviews with parents of children with problematic feeding, and review of items on related instruments. Content validity was tested using content validity indices (CVI) with 19 multidisciplinary professionals who care for children with problematic feeding and found to be acceptable (scale-level CVI $\geq$ .9). Professionals were asked to determine the upper age limit for whom the ChOMPS would be appropriate, and they indicated 7 years would be the most appropriate. The ChOMPS content was validated with 19 parents using cognitive interviews, and revisions were made based on their feedback. Consistent with recommendations for health-related materials, the ChOMPS is written at a less than sixth-grade reading level (Roberts, Zhang, & Dyer, 2016). The final version of the ChOMPS included 70 items comprehensively describing oral-motor and eating-related fine and gross motor skills in children who are supportive of successful and safe oral intake of liquids and foods of various consistencies. All items are prefaced with the phrase *My child can* followed by a statement of a skill. The response options are *yes* (indicating established skill), *sometimes* (indicating emerging skill), and *not yet* (indicating not yet emerging skill).

Validation measures. Because there are no parent-report measures of young children's eating skills (Pados et al., in press), the convergent validity of the ChOMPS was evaluated with two existing measures that assess theoretically related concepts. The ChOMPS includes a variety of gross and fine motor skills that are supportive of eating; therefore, we tested the convergent validity of the ChOMPS using two established measures of a child's motor skills, which have sound psychometric properties. A single measure was not available for the full age range of our sample, so two measures were used, depending on the child's age. For children 6 months to 5 years old, the gross and fine motor developmental domains of the Ages & Stages Questionnaires®, third edition (ASQ-3™) was used (Squires, Twombly, Bricker, & Potter, 2009). For children 5 to 7 years old, the PROMIS® Pediatric Parent Proxy Short Form—Mobility and Upper Extremity (see http://www.nihpromis.org) was used.

The ASQ-3™ is a parent-report tool to measure child development in five domains: communication, gross motor, fine motor, problem-solving ability, and personal-social functioning with 21 versions specific to the age of the child. Each domain consists of six items. For each item,

parents indicate whether their child has mastered the milestone (*yes*, 10 points), partly/inconsistently (*sometimes*, 5 points), or *not yet* (no, 0 points). Sum scores are calculated for each domain and a score of two standard deviations (*SD*s) or more below the norm, derived from a sample of 18,572 children in the United States, is considered a possible developmental delay (Squires et al., 2009). The cut-off of two *SD*s or more below the norm demonstrated excellent sensitivity (86%) and specificity (86%) in identifying children with a possible developmental delay across all domains (Squires et al., 2009). For this study, sums of the gross and fine motor domain scores were calculated for each child and children with a possible developmental delay were identified using a cut-off specific to each age interval. The ASQ-3 has been reported to have good-to-acceptable reliability across all age intervals (internal consistency reliability = .51-.84, test–retest reliability = .75-.82, interrater reliability = .43-.69; Squires et al., 2009). In the current study, internal consistency reliability was .88 on the ASQ-3 gross motor domain and .84 on the ASQ-3 fine motor domain.

The PROMIS® parent proxy report scales are designed for proxy respondents of children 5 to 17 years old to report the respondents' perceived outcomes of the child's health (Irwin et al., 2012). The parent proxy report scales were developed from the existing pediatric self-report item banks covering health outcomes of children 8 to 17 years old across six domains (physical function, emotional distress, social peer relationships, fatigue, pain interference, and asthma aspect) that had been systematically developed (Cella et al., 2007; Irwin, Varni, Yeatts, & DeWalt, 2009; Walsh, Irwin, Meier, Varni, & DeWalt, 2008) and validated using a diverse sample of children with chronic health conditions (Brandon, Becker, Bevans, & Weiss, 2017; Kratz et al., 2013). The parent proxy report scales were content validated through cognitive interviews with 25 caregivers of children 5 to 17 years old (Irwin et al., 2012) and field-tested with a total of 1,980 caregivers of children 5 to 17 years old using item response theory (IRT) analysis (Varni et al., 2012; Varni et al., 2014). For this study, we used the two domains of PROMIS parent proxy short forms that measure physical functioning—mobility (eight items) and upper extremity (eight items); all items included in the physical functioning short forms were found to produce reliable scores at the level of reliability above .90 (Varni et al., 2012). The mobility domain measures activities of physical mobility such as getting out of bed or a chair to activities such as running, and the upper extremity domain measures activities that require use of the upper extremities including shoulder, arm, and hand activities (see http://www.nihpromis.org). Each item was rated based on five-response options scored as 4 *with no trouble*, 3 *with a little trouble*, 2 *with some trouble*, 1 *with a lot of trouble*, and 0 *not able to do*. Sums of each domain were calculated and converted to standardized *T* scores with higher scores indicating less difficulty in performing physical activities. In the current study, internal consistency reliability was .96 on the mobility domain and .95 on the upper extremity domain.

To evaluate the convergent validity with these two validation measures, we hypothesized that (a) children without delayed gross and fine motor skill development based on the ASQ-3 will have significantly higher ChOMPS scores and (b) children with higher scores on the PROMIS measures will have significantly higher scores on the ChOMPS.

Data Collection Procedure

All eligible parents were invited via email to complete the initial survey using the Qualtrics platform (Qualtrics, Provo, UT) and to focus on a single child as they responded to each of the questions. The initial survey consisted of the ChOMPS and a set of questions to describe parent and child demographics as well as child health and feeding history. For parents of children between 6 and 7 years old, the initial online survey also included the PROMIS parent proxy short forms—mobility and upper extremity. At the end of the initial survey, parents of children between 6 months and 5 years old were asked if they were interested in completing a paper version of the

ASQ-3. Parents interested in completing the ASQ-3 were sent the questionnaire specific to the child's age via mail with a return envelope and were asked to return the ASQ-3 within 1 to 2 weeks of the initial online survey. All parents who completed the initial survey (Time 1) were asked whether they were interested in completing the ChOMPS again 2 weeks later (Time 2) for test–retest reliability. Time 1 and Time 2 surveys were completed 2 to 3 weeks apart. Data collection for the ASQ-3 and Time 2 survey was continued until approximately 20% of the original targeted sample size (i.e., $n \leq 70$) had participated. This consecutive sampling plan was used to introduce randomness to the samples for the ASQ-3 and Time 2 survey as well as to assure the size of these samples exceed the recommended sample size (DeVet, Terwee, Mokkink, & Knol, 2011). To encourage participation of parents in the ASQ-3 and Time 2 survey, up to two reminders were sent. In recognition of the time spent to complete the survey, parents were offered a US$10 gift card at the completion of the initial survey and an additional US$5 gift card at the completion of either the ASQ-3 or Time 2 survey.

Data Analysis

Data were analyzed using SPSS Version 24.0 (IBM Corp, Armonk, NY). Cases with more than 10% of data missing on the ChOMPS or any of the validation measures were excluded from the analysis to reduce the risk of bias in the statistical analysis (Allison, 2002). Cases with ≤ 10% of data missing were treated with pairwise deletion in the analysis. For all statistical testing, 5% significance level was used (two tailed).

Sample characteristics. Descriptive statistics were computed to summarize characteristics of the study participants. Sensitivity analyses were conducted to assess whether the subsamples used for test–retest and convergent validity analyses maintained characteristics similar to the original sample.

Item analysis and factor extraction. For each of the items, descriptive statistics, item-total correlation and interitem correlations (r, Pearson's correlation coefficients) were calculated. Any items that correlated at $r \geq .90$ or that failed to correlate with any other items at $r \geq .30$ were considered for deletion. With the remaining items, principal component analysis (PCA) with varimax rotation was conducted through the following steps. First, the suitability of the data for PCA was assessed using Bartlett's test of Sphericity and the Kaiser Meyer–Olkin (KMO) statistic. The range of possible components to extract was assessed based on eigenvalues > 1 as well as scree plot inspections. Within the range of possible components determined, PCA was performed several times through a systematic and iterative process. Each component solution was evaluated for the total variance explained by the component solution, added variance explained by each component (>5%), number of the items with low component loadings (<.30), number of cross-loading items (items cross-loaded on more than one component at ≥.30), and conceptual cohesion of the components. The component solution that retained a conceptually meaningful and psychometrically robust set of items in each component was chosen as the best solution. Finally, with the final component solution, items that cross-loaded at > .30 on two components were considered for movement to a different component based on the conceptual fit with other items in the components. Items that cross-loaded on two components with a < .15 difference between component loadings or that had low component loadings (<.30), were considered for deletion.

Reliability. With the final set of the items after the PCA, reliability was assessed for each of the ChOMPS components and the total scale. Internal consistency reliability was evaluated using both Cronbach's alpha and McDonald's omega coefficients with the acceptable criteria of ≥ .70. Test–retest reliability was evaluated using Pearson's correlation coefficients assessing the strength and direction of the relationships between the ChOMPS scores obtained 2 weeks apart.

Table 1. Child Age and Sex Distribution ($n = 364$).

Age range \ Sex	Female *n*	Male *n*	Total *n* (%)
6-9 months	6	4	10 (2.8)
9-12 months	9	19	28 (7.7)
12-15 months	11	12	23 (6.3)
15-18 months	6	18	24 (6.6)
1.5-2 years	18	24	42 (11.6)
2-2.5 years	10	15	25 (6.9)
2.5-3 years	19	17	36 (9.9)
3-4 years	20	28	48 (13.2)
4-5 years	19	25	44 (12.1)
5-6 years	14	22	36 (9.9)
6-7 years	20	27	47 (13.0)
Total *n* (%)	152 (41.9)	211 (58.1)	364 (100)

Convergent and known-groups validity. Convergent validity in children 6 months to 5 years old was evaluated using independent *t* tests to examine differences in the ChOMPS total and component scores between children with and without possible developmental delay as identified by the gross and fine motor domains of the ASQ-3. Convergent validity in children 5 to 7 years old was evaluated using Pearson's correlation coefficients to examine relationships between the ChOMPS total and component scores and PROMIS® parent proxy short forms for mobility and upper extremity. Known-groups validity was evaluated using independent *t* tests to examine whether the ChOMPS total and component scores were different between children with and without feeding problems.

Results

Sample Characteristics

The initial sample included 378 parents. Fourteen participants were identified to have more than 10% of data missing on the ChOMPS. Because these cases were rare (4%) and the sample size without these cases ($n = 364$) was still within the recommended five to 10 respondents per item (Tinsley & Tinsley, 1987) and in the range of a good to very good sample size for factor analysis (Comrey & Lee, 1992), we excluded them from the analysis. The final sample included 364 parents. Most study participants (98%) were from the United States. The other participants were from Europe. Within the United States, 45% of the respondents were from North Carolina, 7% were from Massachusetts, and the remaining participants were from 37 other continental states and the District of Colombia. The target children represented all intended age categories with a slightly greater proportion of males in most categories (Table 1). About 57% of children ($n = 206$) were identified as having feeding problems. For the purpose of this analysis, a feeding problem was defined as parent report of the child having (a) a parent-identified feeding problem, (b) a diagnosed feeding problem, (c) received care from a professional in the past 6 months for a feeding issue, or (d) a feeding tube for supplemental feeding. Characteristics of the parent respondents and their children are described on Table 2.

Item Analysis

The initial item pool included 70 items. Interitem correlations revealed that three pairs of items were correlated at $\geq .90$ indicating possible redundancy of the concept being measured by those

Table 2. Descriptive Statistics for Characteristics of the Respondents and Their Child ($n = 364$).

Variable	*n*	%
Relationship to child		
Mother	347	95.3
Father	15	4.1
Other	2	0.6
Race ($n = 363$)		
White	297	81.8
Black	20	5.5
Multiracial	16	4.4
Asian	18	5.0
Hispanic	9	2.5
Other	3	0.8
Household income ($n = 360$)		
<US$20,000	6	1.7
US$20,000-US$39,999	40	11.1
US$40,000-US$59,999	47	13.0
US$60,000-US$79,999	71	19.7
US$80,000-US$99,999	64	17.8
>US$100,000	132	36.7
Education		
High school degree or less	24	6.6
Technical school/community college	32	8.8
College/university or more	308	84.6
Family type		
Two parents	331	90.9
Single parent	27	7.4
Other	3	1.7
Selected child conditions[a]		
History of prematurity ($n = 362$)	94	26.0
Developmental delay	73	20.1
Sensory processing disorder	46	12.6
Genetic disorder	39	10.7
Congenital heart disease	30	8.2
Cerebral palsy	32	8.8
Autism spectrum disorder	24	6.6

[a]Multiple conditions could be selected.

items. One of these items was removed, but we retained the remaining items with high correlations because each item was determined to represent a unique skill. In addition, one item failed to correlate with any other items at $\geq .30$, indicating this item did not contribute to the construct being measured. This item also demonstrated an antiimage correlation of $< .50$ suggesting it was a problematic item. Therefore, we removed this item from further analysis.

Factor Extraction

PCA with varimax rotation was conducted on the remaining 68 items. The KMO statistic was .908, indicating an adequate sample size (Kaiser, 1974) and Bartlett's test of sphericity was statistically significant ($\chi^2 = 25{,}057.2, p < .001$), indicating the sample was suitable for PCA (Bartlett,

1950). The initial analysis using eigenvalues greater than 1 revealed 13 components, explaining 74.45% of the total variance. Upon examining the scree plot, it was determined that a five-component solution would more appropriately represent the data. We systematically evaluated six-, five-, and four-component solutions. In the six- and five-component solutions, the last components (sixth and fifth) added insufficient explanation for the amount of the variance (3.57% and 2.85%, respectively) and there was less conceptual cohesion of items in individual components. The four-component solution was identified as the most conceptually meaningful solution with items measuring similar constructs grouped as well as the solution explaining 56.07% of the total variance with a sufficient amount of the variance contributed by the last (fourth) component (5.38%).

With the four-component solution, we further examined cross-loading items and items with low component loadings. Four items were removed based on cross-loading on more than one component with a difference of $< .15$ and/or a poor conceptual fit with other items in that component. One further item was removed due to a low component loading at $< .30$. Component loadings of all remaining items ranged from .44 to .84, indicating that all of the retained items contributed substantially to their associated components (Table 3). The final four-component solution with 63 items explained 58.45% of the total variance with sufficient variances contributed by each of the four components (22.90%, 16.83%, 12.70%, and 6.01%, respectively).

The PCA resulted in 63 items measuring child eating, drinking, and related skills across four different components. Component 1 included items representing skills needed for complex movements, such as *(My child can) hold an open cup and drink by himself/herself with no or little spilling of liquid from mouth*. Component 2 included items representing skills needed for basic movements, such as *(My child can) bring a bottle or sippy cup to mouth*. Component 3 included items representing skills needed for oral-motor coordination for eating, such as *(My child can) take a bite of soft food, such as a muffin or banana*. Component 4 included items representing fundamental oral-motor movements related to eating, such as *(My child can) close lips completely* and *open mouth wide enough to accept a spoon*. See Table 3 for the complete list of items for each component. Each component was named based on the items included in each component (e.g., Component 1 [*complex movement patterns*—23 items], Component 2 [*basic movement patterns*—20 items], Component 3 [*oral-motor coordination*—14 items], and Component 4 [*fundamental oral-motor skills*—six items]. Hereafter, the components are referred to as subscales of the ChOMPS.

Reliability

Internal consistency reliability was evaluated using Cronbach's alpha and McDonald's omega coefficients for the total ChOMPS and each subscale. Cronbach's alpha was acceptable at .97 for the total ChOMPS and .97, .94, .93 and .74 for the four subscales, respectively. McDonald's omega was also acceptable at .97 for the total ChOMPS and .97, .95, .93, and .75 for the four subscales, respectively. All items had item-total correlations $> .3$ and the Cronbach's alpha would not increase if any of these times were deleted.

Test–retest reliability was used to evaluate the temporal stability of the ChOMPS through correlations between the ChOMPS total and subscale scores at the initial completion (Time 1) and 2 weeks later (Time 2). A total of 79 parents completed the ChOMPS at both time points. To minimize the confounding effect of any changes in the child's condition over 2 weeks that might have affected scores of the ChOMPS other than measurement errors, we asked parents if there was anything significant that had changed about their child's eating in the past 2 weeks. We then selected cases in which no changes were indicated ($n = 48$). For example, if parents indicated they had implemented new strategies to manage their child's feeding problem, had offered new/different foods in the past 2 weeks, or if the child had a surgical procedure, we did not use their Time 2 data in the test–retest analysis. The sensitivity analysis revealed that the subsample used

Table 3. Component Loadings for Principal Component Analysis With Varimax Rotation of the ChOMPS.

Subscale	ChOMPS item	Component loadings
Complex Movement Patterns	Walk up two to three stairs without holding on to someone or something	.84
	Run 10-20 steps without falling	.84
	Use a fork to stab a piece of food and bring to mouth	.83
	Walk down two to three stairs holding on to someone or something	.83
	Scoop food onto a spoon or fork and bring to mouth	.82
	Jump with both feet without holding on to anything	.82
	Walk down two to three stairs without holding on to someone or something	.81
	Walk up two to three stairs holding on to someone or something	.80
	hold an open cup and drink by himself/herself with no or little spilling of liquid from mouth	.79
	Walk 10-20 steps by himself/herself	.78
	Speak using words that people outside our family can understand	.75
	Use tongue to lick food from corners of mouth	.74
	Use upper teeth or lip to clean food from bottom lip	.71
	Drink from an open cup holding rim with lips (not biting rim with teeth)	.69
	Stand without holding on to anything	.67
	Eat hard, crunchy food, such as a raw carrot stick, without gagging, coughing, or choking	.67
	Take a bite of hard, crunchy food, such as a carrot stick	.66
	Use a filled spoon or fork to bring food to mouth	.65
	Use tongue to lick food off of top lip	.65
	Pucker lips to kiss or blow	.62
	Drink from an open cup held by an adult with no or little spilling of Liquid from mouth	.60
	Drink from a straw	.59
	Keep tongue in mouth when drinking from an open cup (held by self or an adult)	.54
Basic Movement Patterns	Sit upright without support	.88
	Stand holding on to something (such as, a table or couch)	.80
	Support weight on forearms when lying on tummy	.76
	Roll over from tummy to back	.75
	Twist body to their left and right while sitting without support (such as, to reach for a toy or look at something)	.74
	Crawl when placed on tummy	.73
	Roll over from back to tummy	.72
	Use fingers like a rake to bring food or a toy toward self	.72
	Grasp a piece of food between thumb and another finger (such as, pick up a cheerio)	.68
	Pull up to stand	.68
	Bring a toy or piece of food to mouth	.66
	Hold head up when lying on tummy	.65

(continued)

Table 3. (continued)

Subscale	ChOMPS item	Component loadings
	Bring a bottle or sippy cup to mouth	.63
	Hold a bottle or sippy cup	.63
	Keep head steady when in a supported position (such as, with back against a chair or while being held)	.62
	Hold a toy in hand	.60
	Walk holding on to someone or something	.59
	Move a toy or a piece of food from one hand to the other	.57
	Bring one or both hands to mouth	.56
	Sit upright with support (such as, sit with back against a chair or while being held)	.51
Oral-motor Coordination	Eat food that dissolves, such as a baby puff, without gagging, coughing, or choking	.80
	Eat soft food, such as a pancake, without gagging, coughing, or choking	.80
	Eat textured food with some lumps, such as a lightly mashed banana, without gagging, coughing, or choking	.76
	Eat textured food, such as coarse oatmeal, without gagging, coughing, or choking	.76
	Take a bite of soft food, such as a muffin or banana	.69
	Take a bite of firm food, such as a cracker or cookie	.65
	Eat firm food, such as a peeled slice of apple, without gagging, coughing, or choking	.65
	Eat chewy food, such as a piece of hot dog, without gagging, coughing, or choking	.62
	Use tongue to move food around in mouth	.59
	Eat a spoonful of smooth food, such as a baby food or yogurt, without gagging, coughing, or choking	.57
	Move jaw up and down to chew	.57
	Keep solid food in mouth when eating	.56
	Drink thin liquids, such as water or juice, without gagging, coughing, or choking	.49
	Keep tongue in mouth when food is offered on a spoon	.44
Fundamental Oral-motor Skills	Move chin down to chest	.59
	Move tongue inside mouth from side to side	.56
	Bite down so that teeth or gums touch	.53
	Close lips completely	.50
	Stick tongue out past teeth or gums	.48
	Open mouth wide enough to accept a spoon	.48

Note. ChOMPS = Child Oral and Motor Proficiency Scale.

for the test–retest analysis was not significantly different from the original sample in terms of the child's age or sex, presence of feeding problems, or sample characteristics listed on Table 2, except for the child's medical conditions. The test–retest sample had significantly more children with medical conditions than the original sample ($X^2_1 = 9.26, p < .05; n = 364$). The ChOMPS total and subscale scores at baseline and 2 weeks later were strongly correlated ($r = .80\text{-}.98, p < .001$), suggesting acceptable test–retest reliability.

Table 4. Comparison of the ChOMPS Total and Subscale Scores Between Children With and Without a Possible Developmental Delay in Gross and Fine Motor Skills Using the ASQ-3.

	Normal gross motor development (n = 64)	Delayed gross motor development (n = 19)			Normal fine motor development (n = 72)	Delayed fine motor development (n = 12)		
	M (SD)	*M (SD)*	*t*	*p*	*M (SD)*	*M (SD)*	*t*	*p*
ChOMPS total	107.1 (20.3)	79.7 (22.2)	−5.06	<.001*	105.2 (21.1)	78.0 (26.7)	−3.98	<.001*
Complex movement patterns	30.4 (15.7)	16.2 (10.9)	−3.69	<.001*	29.3 (25.6)	16.8 (7.8)	−2.58	.012*
Basic movement patterns	39.4 (1.6)	35.2 (7.0)	−2.65	.016*	39.2 (1.9)	34.0 (8.5)	−2.12	.057
Oral-motor coordination	25.8 (3.9)	18.3 (8.5)	−3.74	.001*	25.2 (4.7)	17.8 (9.1)	−2.78	.017*
Fundamental oral-motor skills	11.5 (1.1)	10.1 (3.1)	−1.98	.063	11.4 (1.1)	9.4 (3.7)	−1.91	.082

Note. ChOMPS = Child Oral and Motor Proficiency Scale; ASQ = Ages and Stages Questionnaires. Children with a possible developmental delay on the gross and fine motor domain of the ASQ-3 were determined based on two *SD*s or more below the U.S. norm (Squires, Twombly, Bricker, & Potter, 2009).
*$p < .05$.

Construct Validity

Convergent validity in children 6 months to 5 years old. A total of 89 parents of children between 6 months and 5 years old completed the ASQ-3 gross and fine motor domains. After removing the cases with more than 10% of data missing, 83 parents completed the gross motor questionnaire and 84 parents completed the fine motor questionnaire. The sensitivity analysis revealed that the ASQ-3 sample was not significantly different from the original sample of children younger than 5 years old (n = 290) in term of the child's age or sex, presence of feeding problems, or sample characteristics listed on Table 2, except for the parent's education and child's medical conditions. That is, compared to the original sample of children younger than 5 years old, the sample that completed the ASQ-3 had proportionally fewer children with medical conditions ($X^2_1 = 5.72, p = .02$) and more parents with education from Technical School and Community College ($X^2_2 = 9.87, p < .001$).

Children who were identified with a possible delay in their gross motor skill development (n = 19) scored significantly lower on the ChOMPS total and subscales (except for the *fundamental oral-motor skill* subscale), compared with children without disabilities (n = 64; Table 4). Children who were identified with a possible delay in fine motor skill development (n = 12) scored significantly lower on the ChOMPS total and *complex movement pattern* and *oral-motor coordination* subscales, compared with children without disabilities (n = 72; Table 4).

Convergent validity in children 5 to 6 years old. A total of 56 parents of children 5 to 7 years old completed the PROMIS measure for mobility and upper extremity; no cases had more than 10% of data missing so all cases were used in the analysis. The sensitivity analysis revealed that the subsample was not significantly different from the original sample of children 5 to 7 years old (n = 74) in terms of the child's age, presence of feeding problems, or sample characteristics listed on Table 2, but was significantly different on the child's sex ($X^2_1 = 5.13, p = .02$), with proportionally more females in the PROMIS subsample.

The ChOMPS total score demonstrated a strong correlation with the PROMIS measure both for mobility ($r = .80, p < .001$) and upper extremity ($r = .70, p < .001$). For the ChOMPS subscales, *complex movement patterns* correlated strongly with the PROMIS measure for mobility ($r = .87, p < .001$) and upper extremity ($r = .70, p < .001$). *Basic movement patterns* and *oral-motor coordination* subscales correlated moderately with the PROMIS measure for mobility (r = .60 and .50, respectively, $p < .001$) and upper extremity (r = .40 and .47, respectively,

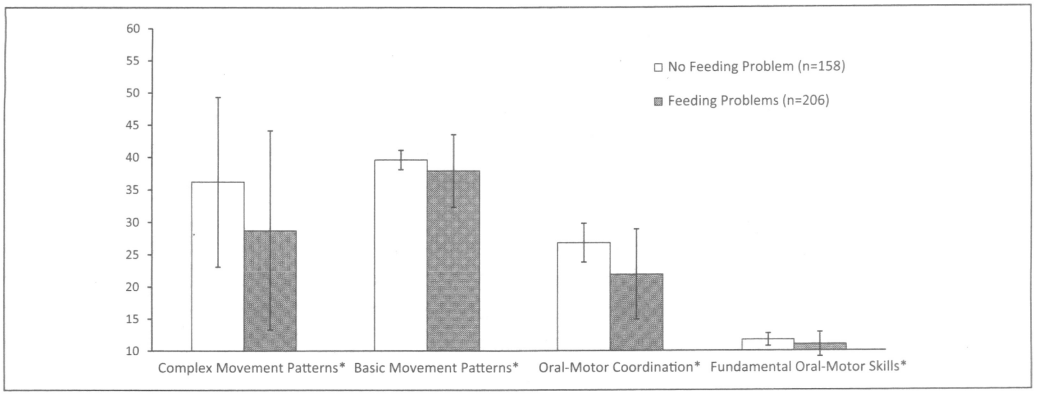

Figure 1. Comparison of the ChOMPS subscale scores between children with and without feeding problems (defined below).

Note. Error bars represent ± standard deviation; Children with feeding problems were determined based on parent-report of a child either who (a) had a parent-reported feeding problem, (b) had a diagnosed feeding problem, (c) had received care from a professional in the past 6 months for a feeding issue, or (d) used a feeding tube for supplemental feeding. ChOMPS = Child Oral and Motor Proficiency Scale.

*$p < .001$ using independent t test.

$p < .001$). *Fundamental oral-motor skills* did not correlate with any of the PROMIS measures ($r = .20, p > .05$).

Known-groups validity. For this analysis, children with feeding problems were identified based on the criteria described previously. Distributions of children's age and sex were not statistically different between children with and without feeding problems ($X^2_1 = 5.56, p = .85$; $X^2_1 = 0.02, p = .90$, respectively); therefore, these factors were not considered in the analysis. The ChOMPS total score significantly differentiated typically developing children from children with feeding problems ($M \pm SD = 114.4 \pm 16.3$ vs. 99.5 ± 25.1; $t = 6.84, p < .001$). Each subscale also significantly distinguished typically developing children from those with feeding problems (Figure 1).

Discussion

The ChOMPS has been developed systematically and the content was validated as a parent-report instrument. It allows for the comprehensive assessment of eating, drinking, and related skills supportive of safe and efficient oral intake in children between 6 months and 7 years old. In this study, PCA with 364 parents of children with and without feeding problems resulted in the 63-item ChOMPS represented by four subscales: *complex movement patterns, basic movement patterns, oral-motor coordination*, and *fundamental oral-motor skills*. The findings of this study provide further evidence of the reliability and validity of scores obtained by this new measure.

The data presented in this study provide strong support for the reliability of the ChOMPS scores by demonstrating acceptable internal consistency reliability for the total and each subscale, ranging from .74 to .97, and test–retest reliability for the total and each subscale, ranging from .80 to .98. Convergent validity of the scores on the ChOMPS was supported by demonstrating meaningful relationships with two theoretically relevant measures, and known-groups validity was supported by differentiating children with and without feeding problems.

Convergent validity of the scores on the ChOMPS was well supported by demonstrating significant relationships between the ChOMPS total score and the scores of conceptually aligned subscales with the ASQ-3 and PROMIS measures. Specifically, children with a possible delay in

the ASQ-3 gross motor domain demonstrated significantly lower scores in the subscales of *complex movement patterns, basic movement patterns*, and *oral-motor coordination.* Children with a possible delay in the ASQ-3 fine motor domain demonstrated significantly lower scores in the subscales of *complex movement patterns* and *oral-motor coordination*. Also, scores in the PROMIS measures for mobility and upper extremities demonstrated moderate to strong correlations with scores of the ChOMPS total and the subscales of *complex movement patterns and oral-motor coordination*.

However, the *fundamental oral-motor skills* subscale did not show significant relationships with any of the validation measures. This finding was expected because the ASQ-3 gross and fine motor domains and PROMIS measures for mobility and upper extremity do not include any items measuring oral motor skills. In addition, children with a possible delay in the ASQ-3 fine motor domain demonstrated lower scores in the *basic movement patterns* subscale, but we found only a trending result ($p = .06$). Similarly, the PROMIS measure score for upper extremities showed a weak to moderate correlation with the *basic movement patterns* subscale ($r = .40$). These findings may be because the *basic movement patterns* subscale does not include many items directly measuring fine motor skills.

Strengths and Limitations

A strength of this study is that the sample represents the target population (i.e., parents of children with and without feeding problems between 6 months and 7 years old) by including children across all intended age ranges and a sufficient number of children with feeding problems to allow a thorough representation of problematic eating-related skills. Primary limitations included a lack of racial, educational, and economic diversity in the sample and the use of online recruitment strategies. The participants were primarily White, well-educated, and in two-parent families. Parents who did not have Internet access were not included in the study so the applicability of the ChOMPS to these parents is unknown. In addition, the samples used for the test–retest reliability and convergent validity analyses were relatively small and differed from the original sample on some characteristics. When interpreting ChOMPS scores in the future, characteristics of the original sample may need to be considered in determining reliability and validity of scores for a particular child or group. Future studies with larger samples representing more racial and socioeconomic diversity could strengthen evidence of the instrument's validity across populations.

Finally, the ChOMPS data have been measured on three-response options, which generated categorical data. Therefore, an approach specifically developed for categorical data may have been more appropriate than the traditional factor analysis approach, which assumes data have been measured at least on an equal interval scale. However, there is support in the literature suggesting that a traditional approach can be useful for categorical data as long as the retained factors are conceptually and theoretically meaningful and cross-validated with other evidence (Darlington, 1997; Johnson & Wichern, 2002; Pearson & Mundform, 2010). Our results were conceptually meaningful and cross-validated through construct validity analyses.

Future Directions

We plan to develop a ChOMPS screening instrument (with approximately 10 questions) using IRT. The IRT analysis will allow further examination of item characteristics, including item difficulty. Prior to conducting the IRT analysis, we will also confirm the factor structure of the ChOMPS using an estimator developed for categorical data. Further validation of the ChOMPS with clinical observations of eating skills by clinicians and testing of interrater reliability would enhance the clinical utility of the ChOMPS.

Conclusion

The ChOMPS is a parent-report assessment tool of eating, drinking, and related skills in children 6 months to 7 years old that consists of 63 items represented by four subscales: *complex movement patterns, basic movement patterns, oral-motor coordination, and fundamental oral-motor skills*. The initial psychometric testing provided strong support for acceptable reliability and validity; however, further studies are needed to establish the psychometric properties of the ChOMPS in larger and more diverse racial and socioeconomic samples. Norm-referenced values are now available for the ChOMPS to aid in the interpretation of scores (Pados et al., 2018). Further studies are underway to validate ChOMPS scores with clinician assessment and to develop a 10-item screening version of the ChOMPS.

The ChOMPS has significant implications for both clinical practice and research. It is the first parent-report assessment of eating, drinking, and related skills in children with evidence of acceptable psychometric properties. The ChOMPS should not replace a thorough clinical assessment; rather, it enhances the clinical assessment with an objective, cost-effective measure that does not require specialized training to administer. Incorporating the parent's report of their child's skills also enhances clinical assessment because parents are able to report on the typical skills of their child, which may not be evident during a relatively short clinical assessment, or if the child is uncooperative in an unfamiliar environment (Glascoe, 1999). For research, the ChOMPS can be used in studies to examine the prevalence of eating skill deficits in infants and young children, track the emergence of eating skill development in children at risk of feeding problems from 6 months to 7 years old, and examine the effectiveness of feeding interventions.

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Parent-Implemented Communication Strategies During Storybook Reading

Yusuf Akamoglu[1] and Hedda Meadan[2]

Abstract

Children with developmental disabilities (DD) may experience delays in their ability to speak and communicate with their parents, peers, and others. These children often benefit from evidence-based, parent-implemented communication interventions. In the current study, two mothers were trained and coached to use storybook reading techniques and evidence-based naturalistic communication teaching strategies (i.e., modeling, mand-model, and time delay) while reading books with their children with DD. Using a multiple-baseline design across naturalistic teaching strategies, the following three components were examined: (a) mothers' use of book reading techniques, (b) mothers' rate and fidelity in using the three naturalistic teaching strategies, and (c) children's communication outcomes. After training and coaching, the mothers used the modeling, mand-model, and time delay strategies with higher rates and higher fidelity. The children initiated more communicative acts upon their mothers' use of time delay. The mothers reported that the training and coaching helped them implement the strategies and led to improvements in their children's communication skills.

Keywords

disabilities and development delays, parent training, components of practice, single-case methods, research methods, language and communication, child development

Young children with developmental disabilities (DD) such as autism or cerebral palsy typically experience delays and deficits (e.g., responding, commenting, initiating) in their social communication skills and could benefit from evidence-based interventions specific to social communication skills (Akamoglu, Meadan, & Burke, 2016). These delays include making eye contact, imitating, being responsive, and initiating and maintaining communication (Kashinath, Woods, & Goldstein, 2006). One way to support social communication skills is to use naturalistic communication teaching (NCT) strategies during family's daily routines. Families need to be involved in the process to successfully integrate NCT strategies in the home with their children with DD (Moore, Barton, & Chironis, 2014). Therefore, it is important to teach parents how to be responsive communication partners by using NCT strategies because parents can provide important

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social experiences and facilitate social communication interactions (Akamoglu et al., 2016; Moore et al., 2014).

One mechanism for supporting parents is to provide training and coaching for parent-implemented interventions. These programs focus on teaching the parent to be the primary implementer of the intervention because parents are the key communication partners and can use evidence-based strategies during authentic activities. Teaching parents to implement NCT also provides parents with opportunities to collaborate with professionals and actively participate in the design and implementation of their child's intervention (Rakap & Rakap, 2014; Roberts & Kaiser, 2011).

Researchers have demonstrated that NCT strategies are feasible for parents to implement with high fidelity, and they are considered evidence-based strategies that are related to improvements in the child's communication skills (Roberts & Kaiser, 2011; Wong et al., 2013). Results of several parent-implemented communication intervention studies showed that when provided with structured training and systematic coaching, parents use NCT strategies with higher frequency and fidelity/quality (Brown & Woods, 2015; Meadan, Angell, Stoner, & Daczewitz, 2014; Meadan et al., 2016; Roberts, Kaiser, Wolfe, Bryant, & Spidalieri, 2014). In these studies, children's ages ranged between 2 and 5, and parents were taught to use strategies during natural parent–child interactions via systematic coaching procedures (e.g., teach-model-coach-review by Roberts et al., 2014).

One intervention program, PiCS (Parent-Implemented Communication Strategies; Meadan et al., 2014), has been found to be effective for teaching parents to use specific NCT strategies, including environmental arrangement, modeling, mand-model, and time delay (see also Meadan et al., 2016). These NCT strategies are referred to as PiCS strategies in this article (see Meadan et al., 2014, for a detailed description of modeling, mand-model, and time delay). In PiCS studies, parents learn the use of these strategies via modules (e.g., modeling or time delay module) and receive systematic coaching to use them with high fidelity (quality). The systematic use of coaching strategies that include individualized goals for parent–child dyads, observations, planning, reflection, and feedback makes this program particularly applicable during typical daily routines.

Shared Storybook Reading

The social communication interactions between the parents and their children could be further enhanced throughout different daily routines such as shared storybook reading. Shared storybook reading is a naturalistic routine and social activity in which parents can promote cognitive skills, social engagement, and language and communication skills that match their children's growing abilities (Fleury & Schwartz, 2016; Whalon, Martinez, Shannon, Butcher, & Hanline, 2015; Whitehurst et al., 1994). Because shared storybook reading can be incorporated into daily routines, parents may be able to use shared storybook reading as a regular opportunity to embed NCT strategies.

Justice and Pence (2005) suggested three features that are essential to effective parent-implemented shared storybook reading interactions: parent sensitivity and responsiveness, child engagement, and repeated reading. The first feature, parent sensitivity and responsiveness, refers to parents who allow children time to respond and acknowledge their child's contributions to the interaction. Behaviors of sensitive and responsive adults include observing, waiting, listening, and being face-to-face with the child. The second feature, child engagement, is facilitated by allowing the child to participate during the storybook reading. Child participation might include labeling pictures, commenting, and asking questions. Children are more likely to be engaged when they are allowed to set the pace of the interaction. The third feature, repeated reading, allows for increased familiarity and facilitates vocabulary learning. These three features allow

adults to intentionally scaffold social communication and engagement during shared storybook reading, thus moving children to higher levels of performance within the interaction.

For many children, simply engaging in responsive interactions within a book activity may result in the successful demonstration of target verbal or nonverbal behavior (Fleury & Schwartz, 2016). Interaction with the parent around storybook reading could be naturally reinforcing for many children. To promote participation, ideally, the parent should make comments about the illustrations and events in the story; model new vocabulary, gestures, and/or signs; and invite the child to communicate. However, delays and challenges in language, social communication, and interaction may interfere with a child's ability to interact with the parent and engage in and benefit from shared storybook reading (Crain-Thoreson & Dale, 1999; Fleury & Schwartz, 2016).

Therefore, for children with DD, it may be necessary to use additional techniques (e.g., prompts) to facilitate children's engagement and participation. These techniques can help refocus children's attention on the book, provide feedback about their comments, and give them opportunities to connect the stories to their own lives (Bellon, Ogletree, & Harn, 2000; Whitehurst et al., 1994). To overcome these challenges, shared storybook reading interventions that support participation and communication skills of children with DD have been designed (Fleury & Schwartz, 2016; Towson, Gallagher, & Bingham, 2016; Whitehurst et al., 1994). For example, a specific shared storybook reading intervention, dialogic reading (DR), was developed as a set of prompts (i.e., completion, recall, open-ended questions, wh-questions, and distancing questions) with children who are typically developing or at risk of disabilities (Crain-Thoreson & Dale, 1999; Whitehurst et al., 1994). A large body of research exists regarding the efficacy of DR, particularly for increasing children's expressive oral language (see What Works Clearinghouse [WWC], 2015). Whitehurst and his colleagues' research on DR also aims to facilitate language skills using book reading in children described as disadvantaged, with good evidence of success (Whitehurst et al., 1998). Some researchers specifically examined the use of adapted DR interventions for young children with autism spectrum disorder (ASD; Bellon et al., 2000; Fleury, Miramontez, Hudson, & Schwartz, 2014; Whalon et al., 2015) and reported higher levels of verbal engagement during book reading and more interest in books. However, although these prompts complement naturalistic teaching strategies, they are not derived from naturalistic teaching principles nor were they developed for children with DD or low-incidence disabilities (Colmar, 2014). Therefore, teaching parents to incorporate NCT strategies within shared storybook reading warrants examination in a research context.

The purpose of the present study was to examine the effect of parent training and coaching, *PiCSS: Parent-implemented communication strategies–storybook*, on parents' use of reading techniques and three PiCS strategies (i.e., modeling, mand-model, and time delay) during storybook reading. These three NCT strategies were selected because the parent-implemented intervention literature, and in particular PiCS studies, shows that parents could learn to use and implement them with high fidelity across daily routines and that they are evidence-based strategies that are related to improvements in children's communication skills (Meadan et al., 2014; Meadan et al., 2016). The current study was based on three theoretical frameworks: transactional model, behavioral approach, and social learning theory, which highlights the three important features about the current study. These features are as follows: (a) bidirectional parent and child interactions are critical because the child's behaviors influence the opportunities for parents to provide verbal and nonverbal language input, which might facilitate the child's social communication and interaction skills; (b) NCT strategies are based on behavioral principles, and these principles could help shape both parent and child communicative behaviors; and (c) the quality of parent–child interactions could be enhanced by supporting parents' use of NCT strategies in specific routines where one-on-one interactions occur such as shared storybook reading routine.

Specifically, the following research questions were investigated:

Research Question 1: Is there a relation between training and coaching parents to use shared storybook reading techniques and increases in parent's fidelity of technique use?
Research Question 2: Is there a functional relation between training and coaching parents to use specific PiCS strategies (modeling, mand-model, time delay) during shared storybook reading and the parent's rate and fidelity (quality) of strategy use?
Research Question 3: Is there a functional relation between the parent's use of PiCS strategies (modeling, mand-model, time delay) and increases in the child's communication behaviors during shared storybook reading?[1]

Method

Participants

To identify and recruit possible participants, a flyer describing the study was distributed to local parent and child disability organizations, and a total of 1 month was allotted to recruit participants.

Inclusion criteria and recruitment. The inclusion criteria for participation were the following: (a) child's chronological age must be between 3 and 5 years; (b) child must have an identified language delay in the Individualized Education Program (IEP) and/or a diagnosis of DD; (c) the parent reports that the child has an interest in storybooks and indicates interest in the study; (d) the parent reports that they are available to participate in all intervention sessions (two to three sessions a week for 10-12 weeks); and (e) English must be the family's first language. In appreciation of their participation, the families were given a total of US$200.00 (US$50.00 at the beginning and US$150.00 at the end of the study) and several storybooks.

Three different contacts expressed interest in participating and two families met the inclusion criteria and participated in the study. Sarah was a married mother with twins. She and her husband, both White, lived in a small town near a university and earned between US$65,000 and US$85,000 annually. Sarah was stay-at-home mother with a PhD in higher education. Sarah reported that they read storybooks every day before bedtime and during the day with her daughter Emily who was eligible for special education services under the educational category of DD, having been diagnosed with ASD when she was 2 years 6 months old. Emily was 3 years 6 months old at the beginning of the study. During the course of the study, she was receiving special education services in a local inclusive early childhood program along with speech and occupational therapy and private music therapy. Emily primarily used gestures and sounds to communicate and produced approximately seven words functionally prior to the study. She would whine and fuss when she wanted or rejected something. See Table 1 for Emily's initial assessment data.

Noelle was a married mother with one child, Mason, who was 5 years old at the beginning of the study and diagnosed with cerebral palsy when he was 5 days old due to a stroke in utero. She and her husband, both White, lived in a small urban town near a university and earned more than US$100,000 annually. Noelle had a master's degree in music and was working as a vocal instructor. Noelle reported that they read storybooks 3 to 4 times a day with Mason who primarily used single words and short phrases to communicate his needs and wants. He would hit or bite to reject items and occasionally say "no." Mason produced approximately 201 words functionally prior to the study. See Table 1 for Mason's initial assessment data.

Setting

Sarah preferred to conduct all study phases (baseline, training, post-training, and coaching) at a local community setting because it was a site the family visited regularly. The community setting

Table 1. Initial Child Assessment Data.

Measure	Emily	Mason
MCDI[a]		
Words understood	268	313
Words produced	7	201
PLS-5		
TLS	51 (1st percentile)	71 (4th percentile)
ASQ-SE-2	130 (36 months) (cutoff score: 105)	135 (60 months) (cutoff score = 95)
GRTR-R	6 (below average)	11 (average)

Note. MCDI = MacArthur-Bates Communication Development Inventory (Fenson et al., 2002); words produced = number of reported expressive words; PLS-5 = Preschool Language Scale–Fifth Edition (Zimmerman, Steiner, & Pond, 2012); TLS = total language score; ASQ-SE-2 = Ages and Stages Questionnaire–Social Emotional, second edition (Squires et al., 2002); GRTR-R = Get Ready to Read–Revised.
[a]Out of 396 words.

was used as a gym and had a pool, childcare, and rooms for meetings and private occupational therapy services. Emily had been receiving private occupational therapy at the community center for the past year, and therefore, she was familiar with the building. The sessions took place in a small childcare room when no childcare was scheduled. The researcher met with the family at the center on the days when the family had therapy hours scheduled so as to not affect Emily's weekly routine. For Noelle and Mason, all sessions were conducted in the family's home. The primary researcher (first author) met with both families 2 to 3 times a week (across all phases) for a period of 12 weeks in total. The first author was the primary investigator and was a doctoral candidate during the study period.

Book Selection

Read Together, Talk Together (RTTT; Pearson Early Learning, 2006) is a research-based (Whitehurst et al., 1994) book set created to assist educators and parents to use DR techniques as they engage in shared storybook reading. The RTTT toddler (ages 2-3) kit, which contains 20 picture books each (both fiction and nonfiction), was used in this study. At the start of the study, the 20 books were randomly divided into two groups in which the same five books were used during baseline and full maintenance (see definition of phases below) and 15 books were used across intervention phases (post-training and coaching). This way, we tried to minimize the interference of repeated use of the same books in the independent variable (IV). At the beginning of each session, the parent selected at random three of the five books during baseline and three of the 15 books during intervention and allowed the child to select one of those three books to be read during the session. Although shuffling occurred in many of the sessions, repeated reading of some of the books happened multiple times.

Experimental Design

A coaching intervention was implemented within a single-case, multiple-baseline design across four tiers (a set of book reading techniques and three PiCS strategies; Meadan et al., 2014) within each family. In this design, each family served as its own control. To meet the quality indicators and standards of single-case experimental research (Horner et al., 2005; U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, WWC, 2017), a minimum of four data points in the baseline phase were

collected across the book reading techniques and three PiCS strategies (modeling, mand-model, and time delay), and decision to move to the next phase was based on the stability of the data. The design allowed three demonstrations of a basic effect within each family (i.e., across the three teaching strategies taught in the intervention) and replication across the two families. The design for Family 1 (Sarah and Emily) met WWC standards. However, the design for Family 2 (Noelle and Mason) met WWC standards with reservations due to having fewer than five data points during the initial baseline phase.

Baseline. During baseline, the mothers were instructed to use the five books that were randomly chosen from the 20. The mothers were instructed to "read the book as you typically would."

Post-training. Data on all three PiCS strategies and reading techniques were collected after the mothers received two separate trainings, one on reading techniques and one on PiCS strategies (see parent training below). Coaching was not provided during post-training data collection to explore whether training alone (without coaching) was sufficient to change the mothers' behavior.

Training sessions. The initial phase of the intervention consisted of two parent training sessions. Each training lasted approximately 1 hr, without the child present. The first training session focused on shared storybook reading techniques. The techniques were adapted from CONNECT (2011; http://community.fpg.unc.edu/connect-modules/learners/module-6) modules and reviewed by three experts (faculty members) and finalized upon their feedback. The training targeted how to present and read books in a shared and interactive context to engage the child during reading sessions. The reading techniques were categorized as *Before* reading technique (i.e., presenting the book, initial question), *During* book reading technique (praise statements and attention getters), and *After* book reading technique (closure question) (see Table 2). This training consisted of the following components: (a) a handout about the *Before, During*, and *After* book reading techniques was given, and these techniques were explained; (b) video examples of parents using the reading techniques were shown to the mother; (c) the mother practiced the *Before, During*, and *After* book reading techniques with the researcher; (d) suggestions and feedback were provided to the mother; and (e) the researcher reviewed the training and addressed questions and concerns.

The second parent training session occurred on a different day and focused on PiCS strategies and included the following components: (a) information about social communication behaviors was delivered; (b) the PiCS strategies were introduced to the mother using handouts about the strategies; (c) video examples of another mother using each PiCS strategy were shown to the participating mother; (d) the mother practiced all three PiCS strategies with the researcher; (e) suggestions and feedback were provided to the mother; and (f) the researcher reviewed the training and addressed questions and concerns. The demo videos were recorded specifically for this study with a volunteer mother and her 3-year-old son. They were 3- to 4-min videos and shown on the researcher's computer.

Coaching. Coaching was conducted in the following order: (a) book reading techniques, (b) modeling, (c) mand-model, and (d) time delay. For reading techniques, coaching sessions continued until the mother reached a preestablished performance criterion level (i.e., a score of Fidelity 4 [see "Dependent Variables" section for fidelity scores] on reading techniques for two consecutive sessions). For PiCS strategy use, coaching sessions continued until the mother reached a preestablished performance criterion level (i.e., a score of Fidelity 4 on 80% of PiCS strategy use for two consecutive sessions) (see Meadan et al., 2016). After the mother met the performance criterion for each target PiCS strategy, coaching on the next strategy began.

Table 2. Reading Techniques to Engage Children With DD During Storybook Reading.

Group	Reading technique	Example
Before book reading	Presenting the book: Say the *title* and *author* of the book to your child before beginning to read. Ask your child at least one question to build your child's interest in the story.	This book's title is *Say What?* and written by *Angela DiTerlizzi*. "What do you think this book is about?" "Do you think this book is about animals or the cars?"
During book reading	Feedback/Acknowledgment/ Encouragement statements: Provide feedback, acknowledgment, or encouragement statements to your child. Attention getters: Use verbal, nonverbal, or a combination to focus your child's attention on the storybook.	Feedback/Acknowledgment/ Encouragement statements: "I like how you are sitting so nicely with mommy!" "Good job turning the page" "You're right" or "Yes, this is a truck" in the form of feedback. "Yes/Yeah" with animated voice to acknowledge the child's response. Attention getters: "Look at the gorilla!" (pointing to the picture and using a dramatic voice). "Oh, this is so silly" (smiling/laughing while making a comment on picture or story).
After book reading	Closure question(s): At the end of the book, ask your child at least one question to maintain her interest in the story or to relate the story to her life.	Closure question(s): "Which animal makes a funny sound, a Cow or a Sheep? Why? What sound does our dog make?"

Note. DD = developmental disabilities.

The coaching procedures replicated those used by Meadan et al. (2014), which rely on planning, observing, mother reflection, and providing feedback (see also Meadan et al., 2016; Stoner, Meadan, & Angell, 2013). The parent coaching protocol included the following components: (a) mother and the researcher reviewed the targeted PiCS strategy or book reading techniques before the reading session; (b) feedback on the previous session (starting with the second session) was provided by showing the video clip and giving direct feedback on what the mother did well and what needed improvement; (c) the mother and child engaged in shared storybook reading; (d) the researcher observed the mother and child while they were engaged in storybook reading (no prompts or coaching were provided); (e) the mother reflected on her own performance; (f) suggestions and feedback were provided to the mother; and (g) the researcher addressed the mother's concerns or questions and problem-solved if there were any concerns or issues. The feedback examples were as follows: "I suggest asking open-ended questions instead of 'yes/no questions'" and "Great job saying, 'Look at this Gorilla' with animated voice when she was distracted."

Generalization. For both families, generalization sessions were conducted at each family's home. During generalization sessions, when the researcher was not present, and no coaching was provided, both mothers (a) offered three choices of books, (b) engaged in shared storybook reading with their children, (c) recorded the sessions, and (d) uploaded the videos to a Box folder. For generalization sessions, the researcher checked out books from a local library and gave them to the families. These books were different than the ones used in the baseline and intervention phases, but they were similar to those in the RTTT package. That is, they were age-appropriate

and similar in length, contained a similar number of words on each page, included pictures that illustrated story content, and intended to foster dialogue between the mother and the child.

Maintenance. Two types of maintenance data were collected in the families' homes: (a) maintenance with other coaching and (b) full maintenance. Maintenance data on modeling and mand-model that were collected while receiving coaching on time delay are labeled as "Maintenance With Other Coaching," and maintenance data collected when all coaching had ended are labeled as "Full Maintenance."

Independent Variable (IV)

Parent training and coaching on the use of the techniques and strategies served as the IV of the study.

Fidelity of implementation of training. First, during training, the researcher completed training checklists (one for each training) for each family. Second, to assess reliability of the fidelity measure, a second observer watched the video-recorded training sessions and rated the presence and absence of steps on the fidelity checklists for all four of the training sessions. Fidelity of implementation for the training sessions was 100% for both the fidelity checks and the reliability of fidelity.

Fidelity of implementation of coaching. First, during coaching, the researcher completed a coaching checklist with all procedural steps of the coaching protocol. Second, to assess reliability of the fidelity measure, a secondary observer (faculty member) watched 38% of the coaching sessions (eight sessions out of overall 21 sessions from both families) and rated the presence and absence of steps on the fidelity checklists. Fidelity of implementation across the eight coaching sessions was assessed at 94.5% by the second observer across all coaching phases. Point-by-point agreement was calculated by counting the number of agreements and dividing that by the number of agreements and disagreements and multiplying that by 100. The point-by-point agreement between the two observers was 97.5%.

Dependent Variables (DVs)

This intervention addressed four DVs as they are related to the first three research questions. The first three DVs were related to the mothers' high-fidelity use of shared storybook reading techniques (DV1), rate of PiCS strategy use (DV2), and fidelity of PiCS strategy use (DV3). The fourth DV was children's communicative behaviors, which were verbal and nonverbal responses and initiations. The storybook reading sessions were recorded, and the length varied from session to session (3-5 min during baseline, 7-10 min during coaching). To quantify these variables, baseline, post-training, coaching, generalization, and maintenance session videos were coded. To code each reading session, a coding manual that included operational definitions of the DVs and coding rules was adapted from Meadan et al. (2016), reviewed by three faculty members and used in this study.

Parent DVs. The mothers' fidelity use of book reading techniques was coded from a scale of 1 = *low fidelity* to 4 = *high fidelity*. To receive a fidelity score of 4 (Fidelity 4—high fidelity) in reading techniques at the end of the reading session, the mother had to use all three technique groups (*Before, During, After*) along with using the *During* techniques at least 3 times throughout the session (mothers were aware of this rule). The mother received Fidelity 3 if she did not use the *During* techniques at least 3 times and Fidelity 2 if she used only two groups of techniques (e.g.,

only *After* and *Before* techniques throughout the reading session) and so on. The mother's reading technique score was noted after watching and coding the entire session.

The rate of the mother's PiCS strategy use (frequency of each strategy per minute) was calculated by dividing the number of occurrences of each strategy by the number of minutes for each session. The average video length was 4 min during baseline, 6 min during post-training, and 10 min across all coaching sessions. Finally, mothers' fidelity of implementation was coded on a scale of 1 = *low fidelity* to 4 = *high fidelity* (Meadan et al., 2016), and the percentage of high-fidelity strategy use was calculated for each session by dividing occasions of high-fidelity strategy use by the total frequency of strategy use. For example, to receive Fidelity 4 in modeling, the mother had to complete four steps: (a) establish joint attention, (b) present a verbal, vocal, or a gestural model, (c) wait 2-3 s for the child to respond, and (d) respond to the child's behavior (Meadan et al., 2016). If any of these steps were missing, the fidelity score would drop according to the number of steps missing.

Child DV. The child DV was the child's verbal and nonverbal independent responding (e.g., imitated mother's model, responded to mother's mand) and initiating (i.e., initiated a communicative act, 3 s or more, after the last communication exchange). For Emily, both responses and initiations were coded as single-word, vocal, or gesture topographies, and her communication goal was to increase her single-word responses and initiations. For Mason, both responses and initiations were coded as multiple-word, single-word, vocal, or gesture topographies, and his communication goal was to increase his multiword responses and initiations. The communication topographies were selected based on initial assessment results and the mothers' input. Any of these topographies occurring within 3 s of the mother's use of a teaching strategy constituted a response. Child responses were coded per opportunity. To calculate the percentage of the child's response, the number of opportunities was calculated by summing the number of times the mother used Fidelity 3 and Fidelity 4. The number of child responses was divided by the total of three and four occurrences and multiplied by 100. Initiations were coded per occurrence and were tallied to determine the number of times the child initiated communication. The number of times the child initiated communication was a combination of spontaneous initiations and initiations following the mother's use of time delay.

Interobserver agreement (IOA). The first author was the primary observer. Two special education graduate students (secondary observers) who were blind to the experimental procedures and schedule coded the randomly assigned sessions. Before assessing IOA, the secondary observers were trained on the coding procedures and coded a small subset of the sessions, compared their results with the primary coder's results, and discussed disagreements. This process was repeated until the primary and secondary observers reached at least 80% agreement for each coding category. These categories included (a) type of PiCS strategy (modeling, mand-model, and time delay), (b) fidelity level of the PiCS strategy (e.g., Fidelity 4), (c) child's communicative behavior, and (d) fidelity of reading techniques. The categories were described and operationally defined in the coding manual. Agreement was defined as both observers identifying the time stamp with a 3-s sliding scale of the occurrence of a DV and coding each of the DV categories in the same way. After achieving 80% agreement, the secondary coders were assigned randomly selected sessions from each phase to code. The researcher coded all sessions and the secondary observers independently coded a minimum of 33% of the sessions (see Table 3), selected at random, in each phase of the study. In the case of agreements below 80%, the primary and secondary coders met, compared their coding, watched the disagreement time stamps, discussed the reasons for disagreements, and went through coding rules for clarification. Disagreements on fidelity scores were due to the confusion on wait time (2-3 s), and disagreements on child behaviors were due to confusions on communication topographies (verbal, gestures, etc.). IOA was calculated for each coded

Table 3. Interobserver Agreement (IOA) by Phase.

Variable/ family	PiCS strategy (average, range)	Fidelity score (average, range)	Child's behaviors (average, range)	Reading technique (average, range)
Sarah and Emily	98.2 (81-100)	92.2 (60-100)	95.5 (75-100)	94.5 (73-100)
Noelle and Mason	99.3 (95-100)	93.6 (84-100)	93.3 (75-100)	93.6 (75-100)

Note. Averages and ranges are presented as percentages (%). PiCS = Parent-Implemented Communication Strategies.

category as point-by-point agreement by counting the number of agreements, dividing that by the number of disagreements and multiplying that by 100. For example, during phase "coaching for modeling" for Sarah and Emily, PiCS strategy IOA average across two session was 97% (range: 97-97), fidelity score IOA was 94.5 (range: 93-96), child's behavior IOA was 100 (range: 100-100), and reading technique IOA was 85.5 (range: 73-98). Due to the length of the IOA data for each phase and family, only average scores and ranges across all phases are presented in Table 3.

Social Validity

We included both participating mothers and fathers in interviews. Fathers did not participate in the intervention, but they had an insight about their children's progress. Two measures were used to examine mothers' and fathers' satisfaction and perceptions about the overall goals, procedures, and outcomes of the PiCSS project as well as changes in their views of shared storybook reading. The first measure was pre- and post-semi-structured parent interview that was conducted before and after the PiCSS project. Each interview lasted approximately 30 min. The primary researcher conducted the pre-study interviews and another research team member conducted the post-study interviews to minimize parent response bias. The pre-study interviews were audio-recorded and the post-study interviews were video-recorded. The interviews were transcribed and summarized by two members of the research team to generate summaries. The transcript summaries were sent to the mothers to confirm their accuracy and to gain support for the conclusions (Brantlinger, Jimenez, Klinger, Pugach, & Richardson, 2005). The summaries also were sent to another research team member for confirmation. Next, the primary researcher and another research team member met to reach consensus on the summaries.

The second measure was a parent survey that was adapted from Meadan et al. (2016) and consisted of 12 Likert-scale rating questions (1 = *low*; 5 = *high*) that examined the mothers' overall perceptions about goals, procedures, and outcomes of the PiCSS intervention, as well as changes in their views of shared storybook reading. The survey was given to the mothers to complete before and after the study.

Results

Data were analyzed using traditional techniques of single-case research, including visual/graphical analysis of changes in level and trend (Kazdin, 2010). Data from the single-case study are presented in Figures 1 and 2.

Sarah and Emily's Results

Parent behavior. Sarah's data are presented in Figure 1. In baseline, Sarah used reading techniques with poor fidelity. In all five baseline sessions, she received a fidelity score of 1, which means she used only one group of reading techniques.

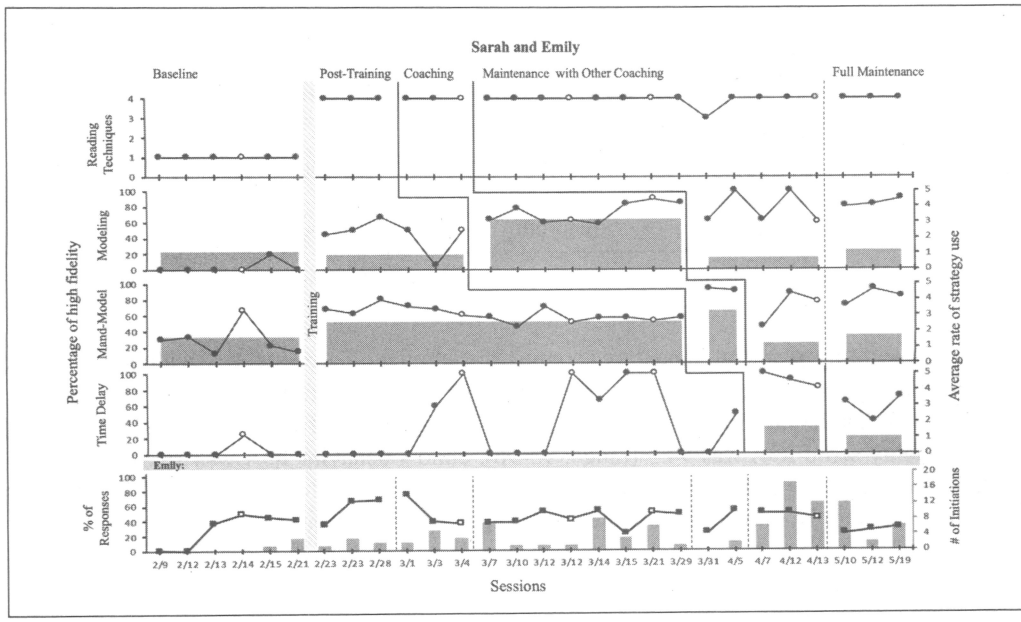

Figure 1. Sarah and Emily's performance.

Note. In Tier 1, the line graph represents Sarah's Fidelity score (e.g., Fidelity 4) in reading technique. In Tiers 2 to 4, line graphs represent Sarah's percentage of high-fidelity (Fidelity 4) strategy use; open symbols represent probes for generalization (i.e., no training or coaching provided); shaded bars reflect the average rate at which Sarah used the strategy during each phase; data points in maintenance with other coaching are sessions when coaching is done on another strategy in Tiers 2 and 3, and points in full maintenance are sessions after Sarah met performance criteria for all strategies and all coaching had ended. Bottom tier represents Emily's communication behavior; line graph shows the percentage of child responses, and shaded bars reflect the number of times the child initiated.

Sarah's use of Fidelity 4 reading techniques increased in level immediately following training and remained stable throughout the post-training and coaching phases. Although Sarah reached the performance criteria (Fidelity 4 for two consecutive sessions) in three of the post-training sessions, she received coaching on the reading techniques for two consecutive sessions to refine her skills. By doing so, she maintained her use of reading techniques along with feedback and suggestions. Researchers' feedback included the following: (a) when and how to deliver feedback/acknowledgment statements when Emily responded, and (b) when and how to use attention getters more effectively when Emily was distracted (e.g., using a dramatic or enthusiastic voice, pointing while referring to a picture).

For PiCS strategies, during baseline, Sarah used modeling rarely (3-5 times), mand-model relatively often (5-10 times), and time delay never (shaded bars). Sarah's rate decreased slightly for modeling, increased for mand-model, and remained low for time delay. After receiving training on all three strategies, changes in Sarah's implementation varied until coaching was introduced. A substantial increase in the rate at which she implemented modeling coincided with coaching. Sarah's rate of using the mand-model strategy increased notably from post-training to coaching, and her level of strategy use was notably higher and more stable during the coaching phase. Increases in rate of strategy use for all three strategies were accompanied by a substantial increase in the percentage of use of modeling and mand-model. The data for the generalization probe sessions in all tiers were similar to the data obtained during coaching, suggesting that Sarah generalized the technique and strategy use to interactions with Emily in the absence of proximal coaching or feedback.

For time delay, it is important to note that during post-training, changes in Sarah's implementation varied substantially until coaching was introduced. Her use of time delay showed some

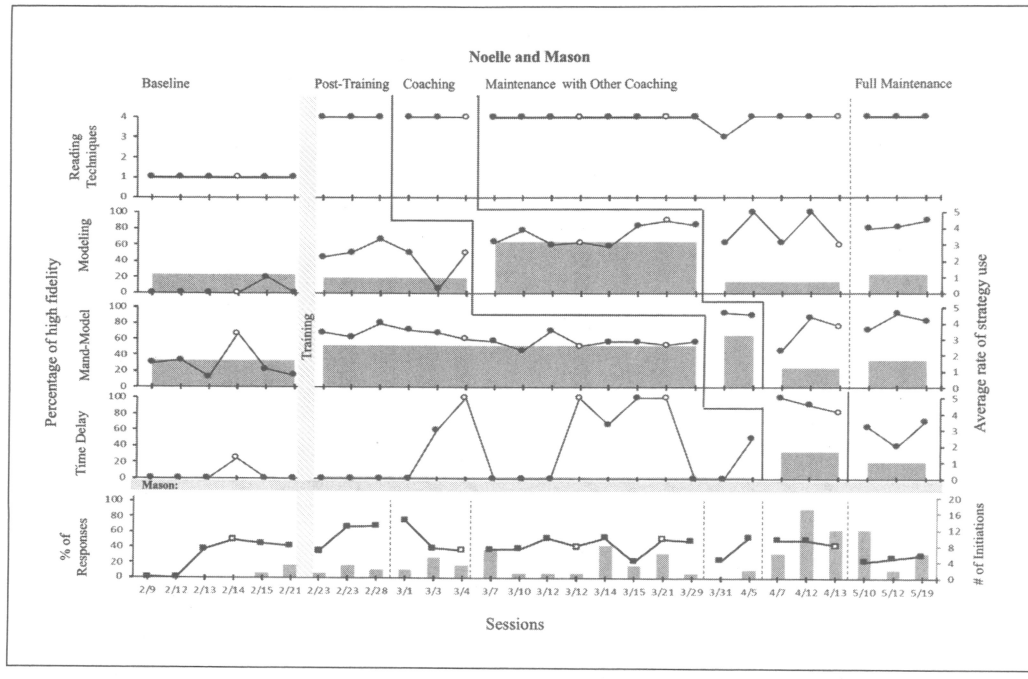

Figure 2. Noelle and Mason's performance.

Note. In Tier 1, the line graph represents Noelle's Fidelity score (e.g., Fidelity 4) in reading technique. In Tiers 2 to 4, line graphs represent Noelle's percentage of high-fidelity (Fidelity 4) strategy use; open symbols represent probes for generalization (i.e., no training or coaching provided); shaded bars reflect the average rate at which Noelle used the strategy during each phase; data points in maintenance with other coaching are sessions when coaching is done on another strategy in Tiers 2 and 3, and points in full maintenance are sessions after Noelle met performance criteria for all strategies and all coaching had ended. Bottom tier represents Mason's communication behavior; line graph shows the percentage of child responses, and shaded bars reflect the number of times the child initiated.

increase in level with extreme variability. For the first five sessions after training, there were no changes in trend, level, or variability. Sarah reached 100% fidelity on one data session (March 15) with a very low rate (1 time). However, she did not reach the performance criterion (two consecutive sessions of 80% and above in the presence of proximal coaching) for time delay after participating in training.

Coinciding with coaching, Sarah's rate and level of strategy use immediately increased for time delay. She used time delay with high fidelity at relatively stable and high percentages and reached performance criteria in two consecutive sessions. Also, in comparison with baseline, Sarah's time delay use was higher both in level and in variability during the full maintenance phase, and there were no overlapping data between full maintenance and baseline indicating behavior change. Overall, we can assume a functional relation between coaching and Sarah's use of modeling, mand-model, and time delay.

Child behavior. Visual analysis of the bottom tier in Figure 1 demonstrates that Emily had a relatively moderate level of responsiveness and low number of initiations during the baseline phase. Visual analysis also reveals that Emily demonstrated a steady upward trend with a higher level of responsiveness after training (post-training phase) was introduced. After the first session of coaching phase (session date, March 1), Emily's percentage of responsiveness showed a downward trend for two sessions and maintained a steady level with slight variability without an increasing slope or level across coaching phases. There were several overlapping data points between baseline and coaching sessions.

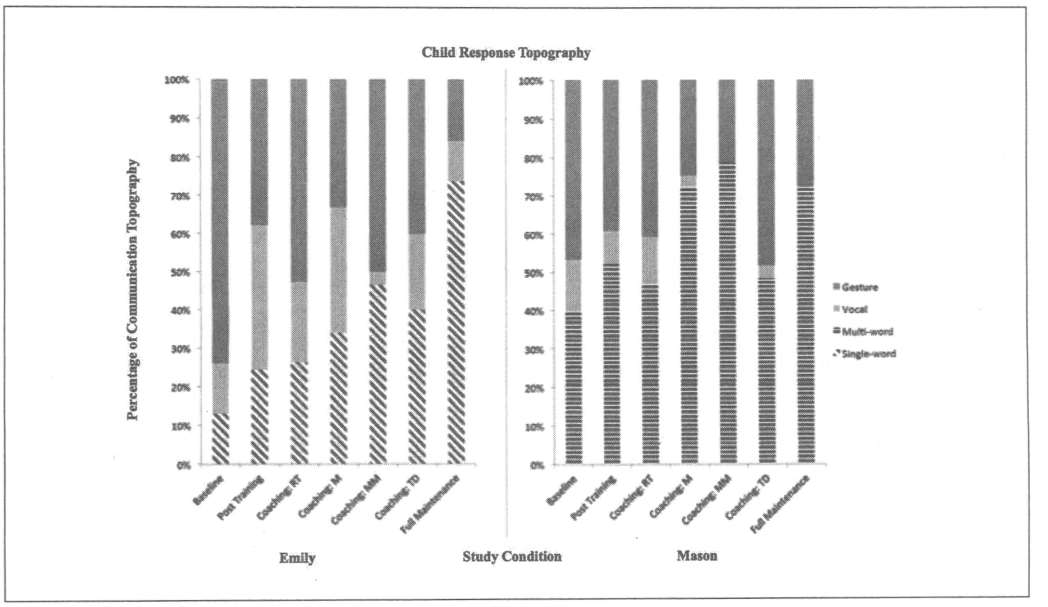

Figure 3. Bar graph of Emily's and Mason's response topographies.
Note. RT = reading technique; M = modeling; MM = mand-model; TD = time delay.

Emily did not produce a clear increase in her number of initiations after training was introduced. Her frequency of initiations increased during several coaching sessions (session dates, March 3, March 7, March 14) with notable variability. The highest and most stable level of initiations appeared to increase when coaching on time delay was introduced. Finally, during full maintenance, Emily's frequency of initiations diminished somewhat but remained well above baseline levels. During the full maintenance phase, her response to her mother's strategy use declined to baseline levels.

Figure 3 represents children's response topography given their mothers' use of PiCS strategies in each phase. Figure 3 reveals clear changes in children's response topographies and in their use of targeted goals such as single-word responses over the course of the coaching phases. Emily used 34 single-word responses during coaching for modeling and 14 during coaching for mand-model. Emily's response topographies changed, and she produced more single-word responses.

Noelle and Mason's Results

Parent behavior. Noelle's data are presented in Figure 2. During baseline, Noelle used reading techniques with poor fidelity. Noelle's use of Fidelity 4 reading techniques increased immediately following training and remained stable throughout the post-training, coaching, and maintenance phases. Regarding PiCS strategies, during baseline, Noelle did not use modeling and time delay strategies. She used the mand-model strategy at low rates with variability. During post-training, Noelle's rate remained low for modeling and time delay and increased for mand-model. Although her fidelity of mand-model was high with notable variability during baseline, her mand-model use was relatively more stable after training. The fidelity of her implementation for modeling remained very low and increased for time delay, but the variability muted any clear change. Noelle's use of mand-model was relatively more stable during post-training and she demonstrated mastery criterion on mand-model in the last three post-training data points and her first coaching data point. Therefore, we moved onto time delay coaching after only one mand-model coaching session.

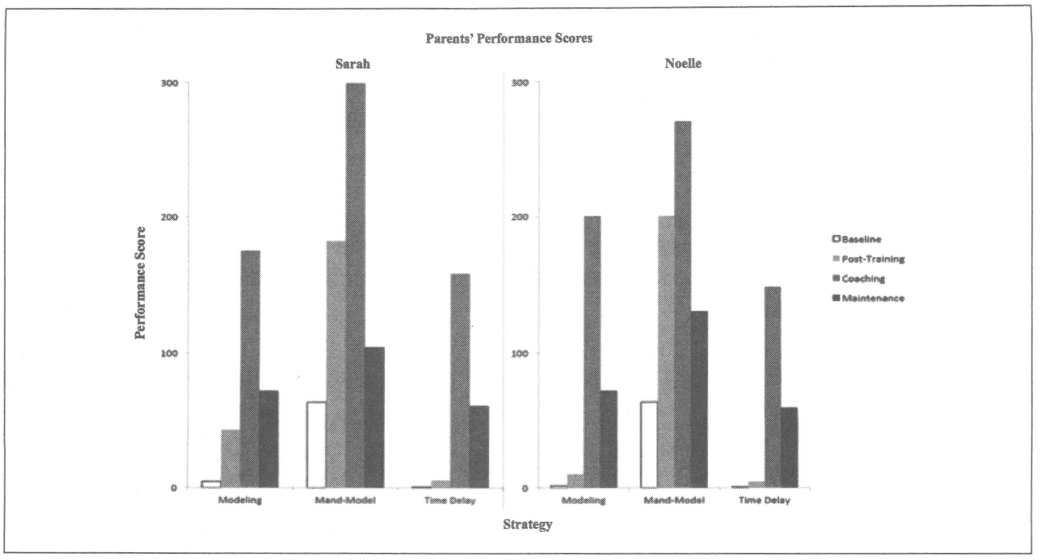

Figure 4. Bar graph of Sarah's and Noelle's performance score for each strategy, calculated by multiplying the average percentage of high-quality strategy use by the average rate of strategy use for each phase.

During maintenance, Noelle applied the strategies at lower rates than during coaching but maintained relatively high levels of fidelity implementation. Noelle's performance during generalization probe sessions was variable but similar in level to that achieved during coaching. In sum, Noelle's high-fidelity strategy use increased and stabilized during the coaching phase, but rates decreased during maintenance. Overall, we can assume a functional relation between coaching and Sarah's use of modeling, mand-model, and time delay.

Child behavior. Visual analysis of the bottom tier in Figure 2 reveals improvement in Mason's responsiveness, after training was introduced, that was maintained throughout the remainder of the study. When coaching on time delay was introduced, an increase was evident in Noelle's rate of implementation that was accompanied by an increase in Mason's frequency of initiations. Finally, during maintenance, his frequency of initiations remained well above baseline levels, but his response to his mother's strategy use declined to baseline levels.

Figure 3 reveals that across six baseline sessions, Mason used six multiword responses, two vocal responses, and seven gestural responses. However, he used 50 multiword responses during coaching for modeling and 53 during coaching for mand-model. His response topographies changed and he produced more multiword responses during coaching.

Performance Score

Overall, we identified a functional relation between parent training and coaching (IV) and parents' rate and high-fidelity strategy use (DV) for both mothers. We also calculated a performance score demonstrating the combined effect of fidelity and average rate of strategy use (generalization probe rates were not included) may provide clarity about the overall impact (see performance scores in Figure 4).

Three key patterns emerge from visual inspection of the histogram in Figure 4. First, Sarah's performance scores reflect a clear gain from baseline to post-training for modeling and mand-model and Noelle's for mand-model. Second, coaching appears to be the intervention component

that had the largest impact on the combined measure of fidelity and rate of strategy use (clear for all three strategies) for both mothers. Third, although both mothers' performance scores clearly diminished between the coaching and maintenance phases on all three strategies, their performance in maintenance remained higher than in baseline for all three strategies.

Social Validity

The complete quantitative and qualitative social validity data and further analysis of other stakeholders' evaluations will be described in another article. A preliminary summary of the qualitative data is presented here.

Goals. In her preintervention interview when describing her goals for Emily's communication, Sarah said,

> I think more, that spontaneous [communication]. . . well even just being able to ask for the book she wants instead of just pointing. You know, being able to say, "I want this book, I want to read Llama Llama [book]" or whatever.

Noelle described her goals for Mason as, "My hope that he will be able to hold a conversation either with his peers or an adult. Obviously, that may be far off."

Regarding their frequency of reading storybooks, Mason's father Bruce said,

> Specifically, every night before dinner, before bedtime but frequently during the day. I work a lot so [Noelle] principally does day time stuff but he [Mason] will bring books to us anytime throughout the day. Sometimes he will bring 10 books.

Sarah's husband John said that reading with Emily is challenging but he uses some strategies to help Emily calm down: "The goal is to try to get through the book before she tries to wiggle off your lap or slam the book or rip the page of a book. . ."

Overall, preintervention interviews suggest that the mothers had specific and realistic goals for their children and that storybook reading was important for them. However, they were struggling to support their children's communication skills and engagement during book reading.

Procedures. Regarding how well the procedures worked for her and whether she enjoyed the procedures or not, Sarah said,

> Initially, some of them [strategies] were a little challenging. . . but the coaching really helped with just kind of going over it and over it, and having him remind me, "oh here's how you can do it." That was helpful.

Noelle shared similar opinions: "He [coach] did a great job of bringing it down to my level like making it easier for us to understand."

In terms of ease of implementation of the strategies, Noelle said,

> Some of them. . . I didn't necessarily understand right away, but he's [coach] a very good teacher and so it was really easy to use it and now, when we read books, I just find myself doing it automatically.

Overall, the participating mothers found the intervention strategies easy to learn and implement during their everyday storybook reading routines. They also reported that the training and coaching procedures were especially helpful in learning the new strategies.

Outcomes. Regarding the outcomes of the study, Sarah expressed her perspective as follows:

> It [PiCSS program] was really useful and I was seeing more results out of that than other things, and I was getting more things that I can do to help out of it. . .with this, every session I feel like I have gotten a little something out of it. So I could then apply it.

Bruce also said, ". . .it never occurred to me until I heard these sessions that it was a more productive way to read than 'just to read' so, I thought it was really helpful for us."

In the pre- and post-surveys, the mothers completed a knowledge scale that asked about their knowledge of naturalistic teaching strategies and reading book techniques. Before the intervention, on a scale of 1 to 5 (1 = *low*; 5 = *high*), Sarah rated her knowledge of and competence in implementing social communication strategies with a 2 and Noelle with a 1. Sarah rated her knowledge of and competence in implementing child engagement strategies in storybook reading with a 3 and Noelle with a 2. After the study, both mothers rated all items on the post-study survey with a 4 or 5.

In sum, the mothers reported that the intervention was socially valid and that they gained practical, evidence-based instructional skills they could use in their home environment to enhance the social communication skills of their children.

Discussion

This study provides support for the effectiveness of delivering systematic parent training and coaching and extends the evidence for the PiCS (Meadan et al., 2014) and Internet-based PiCS (i-PiCS) programs (Chung, Snodgrass, Meadan, Akamoglu, & Halle, 2016; Meadan et al., 2016) that were used in any family routine (e.g., meal time, play time), as effective models of training and coaching to facilitate parent-implemented communication interventions across different family routines such as storybook reading. The single-case design data across tiers provide preliminary information on the associative relations between (a) interventionist coaching strategies and parent strategy use, and (b) parent strategy use and child communication. Single-case design and social validity findings are particularly important because the PiCSS project aligns with recommended practices of building parents' capacity to support children's development during natural routines and activities such as storybook reading (Division for Early Childhood, 2014).

In this section, we discuss (a) shared storybook reading context, (b) PiCS strategies, (c) training and coaching, (d) child outcomes, (e) implications for practice, and (f) limitations and directions for future research.

Storybook Reading Context

By acknowledging their children's smallest attempts to communicate or using an attention getter with dramatic voice (e.g., "Look at these big pigs!") to gain their attention, the mothers showed their children that participation (verbal or nonverbal) was appropriate and expected. Both mothers reported challenges in their children's engagement and participation. A lack of child engagement during book reading is not unique to this study. Previous research has shown that children with disabilities tend to be less engaged in book reading activities (Bellon et al., 2000; Fleury & Schwartz, 2016) and may actively avoid book reading. Attention getters or acknowledgements (feedback) posed by a parent during book reading may set the occasion for the child to verbally or nonverbally participate in the reading activity. For example, while noting the effectiveness of attention getters, Sarah said, "She gets distracted very easily but it [attention getter] helped definitely to bring her back."

Another suggestion for improving child engagement in book reading is to create a comfortable environment where parents can design a specific space for reading that is free from visual or auditory distractions. In addition, parents can make book reading a part of their daily routine and use visual cards and schedules to help their children predict the next activities and facilitate their transitions between routines (Dennis, Lynch, & Stockall, 2012).

PiCS Strategies

The findings on naturalistic teaching strategies are consistent with previous research that supports parent training and coaching as effective methods to increase a parent's fidelity of implementation and enhance children's communication (Meadan et al., 2014; Meadan et al., 2016; Roberts et al., 2014).

For both mothers, fidelity percentages were variable across all phases for each of the strategies. For example, while Noelle used modeling at very low rates even after training, it also took Sarah six sessions to reach the criteria of 80% or above for two consecutive sessions during coaching phase. There are two possible reasons to explain this. First, both mothers started to receive coaching on modeling, and the idea of high fidelity (joint attention, delivering the model, waiting 3 s, and giving feedback) was very new to them. Thus, they struggled to follow the high-fidelity use procedures. Second, Sarah seemed very motivated to model new vocabulary from the books. She focused on quantity of vocabulary modeling (more frequent modeling) rather than quality (high fidelity). For instance, she would often forget to allow the wait time (3 s). After a few coaching sessions, Sarah started to focus on wait time and was more responsive to Emily by acknowledging her responses enthusiastically, thus reaching the criteria.

Both mothers used the mand-model strategy more frequently than the other strategies during the baseline phase. This is not surprising, given that during everyday interactions people seem to use more mands (i.e., questions, choices, or requests) than the other forms of communication strategies on which we focused in this study (i.e., modeling and time delay) (Meadan et al., 2014; Meadan et al., 2016). Yet, the frequency of strategy use without high fidelity is not adequate to elicit responses from children as seen by the changes in the topography of child responses.

Time delay was reported to be the least frequently used strategy in the literature (Akamoglu et al., 2016; Kashinath et al., 2006; Meadan et al., 2014; Meadan et al., 2016). One reason to explain this is that time delay is an antecedent strategy that gives the child a reason to communicate (Kashinath et al., 2006) and, therefore, requires more intentional planning and wait time on the caregiver's end.

Training and Coaching

Training alone was sufficient for reading techniques (*Before, During*, and *After* techniques), but was not for the three PiCS strategies. Both mothers improved their fidelity performance after they received coaching. Improved parent behaviors might have been due to the collaborative and supportive nature of the coaching sessions (planning together and seeking parent reflection). Coaching complements training by facilitating the transfer of knowledge acquired during training into implementation (Dunst & Trivette, 2009). However, it differs from training parents in both theory and application. Parent training models increase parents' knowledge and help them acquire skills to demonstrate their use of specific strategies based on the interventionist's plans for the session (Roberts & Kaiser, 2011). According to the adult learning theory, it is not enough to learn about a strategy; a person needs to practice, reflect, and receive feedback to improve performance (Dunst & Trivette, 2009). The PiCS strategies require more steps and can be used in different context, and it is possible that this was the reason the two mothers needed coaching on these. The coaching model that was adapted in this study (Meadan et al., 2014; Meadan et al.,

2016) enhanced the mothers' competence and confidence by collaborating with them to provide opportunities to refine their skills.

Child Outcomes

Although child outcomes were not the primary DVs of the study, a connection between the mothers' use of the teaching strategies and the children's communication behaviors was present. For example, across six baseline sessions, Emily used three single-word responses, three vocal responses, and 17 gestural responses. She would respond to Sarah's "is this a car or a dog?" question by pointing to the picture instead of verbalizing ("car" or "dog"). Emily used 34 single-word responses during coaching for modeling and 14 during coaching for mand-model. Emily's response topographies changed, and she produced more single-word responses.

The minimal changes in Emily's responsiveness might have been due to two reasons. First, Sarah had indicated that she often became frustrated when she elicited no response from Emily. Thus, she began to use the mand-model strategy with higher frequencies so that she could improve the likelihood of eliciting responses. When she focused on frequency, her fidelity scores started to decrease. For example, she would skip the wait step or would not repeat her mand-model. Second, Emily selected one book from three choices at the beginning of each session. However, although Sarah thought that Emily had book preferences, on a few occasions she selected books that she did not appear to be interested in very much. Thus, her motivation and interest level in certain storybooks could have influenced her responding.

Implications for Practice

This study has several implications for practice. First, the results expand on previously published work, supporting the importance and effectiveness of parent-implemented interventions for young children with DD. Previous studies primarily focused on increasing parents' frequency of use of strategies to facilitate children's communication skills (Kashinath et al., 2006; Moore et al., 2014), whereas this study focused on increasing the parent's high-fidelity technique and strategy use. This is especially important given that higher frequency alone without fidelity is not sufficient to facilitate child communication.

Second, teaching parents strategies to increase the participation of children with DD in storybook reading activities is important. To successfully engage their children in book reading, parents can (a) carefully arrange a distraction0free environment for their children with DD, (b) select books that align with their children's interests, and (c) periodically provide feedback for engaging in appropriate behaviors such as sitting, listening, and participating. Moreover, parents need support beyond providing information (training, webinar, etc.). Practitioners should consider innovative service delivery models that include online (e.g., telepractice) parent training and coaching to address the challenges related to feasibility of this model.

Limitations and Directions for Future Research

There are several limitations to this study. First, the intervention presented in this study was conducted in one state with only two families. Therefore, generalization of the findings beyond these families is limited. Future research should examine the effectiveness of this intervention with more families who represent a broader diversity such as family education attainment, parent interventionist gender and race, child's disability, and geographic location. Third, the behavioral recordings for parent and child were sufficient and sensitive only to a certain extent. For example, the coding system included information about the type of PiCS strategy used but not the type of the mand the parent used (e.g., open-ended questions, choice question, request statement) or

modeling (word, gesture, vocal). Also, child behavior coding systems included behavior topographies but did not include the function of the child's communication (e.g., comment, request, protest). Future research should develop child behavior coding systems that include the function of children's communication (e.g., comment, request, protest) and parent behavior coding systems that include information about the type of mand the parent used (e.g., open-ended questions, choice question, request statement). Future research also can measure several other outcomes such as parent stress, self-confidence, and quality of life.

Conclusion

In conclusion, the findings of this study contribute to the evidence base supporting parent training and coaching interventions that enhance the communication skills of children. The results suggest that providing systematic training and coaching could be one of the support methods to increase parents' fidelity when using reading techniques and naturalistic teaching strategies.

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Note

1. *Technique* vs. *Strategy*: Shared storybook reading techniques refer to a particular way the parent reads the book. PiCS (Parent-Implemented Communication Strategies) strategies refer to specific strategies to achieve an overall goal.

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Recording Support Measures in the Sequential Pedagogical Documents of Children With Special Education Needs

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Abstract

This study investigates the descriptions of support measures in the sequential pedagogical documents (individual education plans or programs and others) of children with special education needs from early childhood education and care to preprimary education. According to the previous research, the role of pedagogical work is largely disregarded in these documents, which typically focus on describing children's challenges instead of support measures. In this study, the sequential pedagogical documents ($N = 257$) of 64 Finnish children were studied for approximately 3 to 6 years, and the data were analyzed by investigating the textual and content-related coherence, as well as the linguistic precision, of the descriptions of support. Consequently, four chronological patterns of describing and developing the support measures—missing, repetitious, disorganized, and explicit—were introduced, and the study results emphasize the importance of the specificity and continuity of documentation.

Keywords

curricula, assessment, instruction, qualitative methods, preschoolers, kindergarteners, early elementary

Introduction

Drafting individualized pedagogical documents, individual education plans or programs (IEPs), or other pedagogical documents for children with special education needs (SEN) is often considered a key element of a successful, high-quality individualized pedagogical plan (Miller, 2014; Pretti-Frontczak & Bricker, 2000; Yell & Stecker, 2003). The practices and prerequisites of drafting pedagogical documents in early childhood education and care (ECEC), as well as the required contents of such documents, vary internationally, depending on educational contexts, educational systems, and the pedagogical documents in question. Typically, pedagogical documents include descriptions of children's strengths, current achievement levels, and challenges, as well as the

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individualized learning objectives of the pedagogical support (see, for example, Gartin & Murdick, 2005; Yell & Stecker, 2003).

The practice of drafting IEPs or other pedagogical documents for children with SEN is well established. Consequently, detailed recommendations for drafting these documents have been given. The overall principle and aim of the documents are to elaborate meaningful, suitable, research-based interventions that support children's education (Drasgow, Yell, & Robinson, 2001; Gartin & Murdick, 2005). The main focus should be on planning and support—what adults do with and for children. Consequently, the development of objectives, goals, and methods form the core of pedagogical documents (Poppes, Vlaskamp, de Geeter, & Nakken, 2002), which should indicate specific interventions and measures to support children (Kwon, Elicker, & Kontos, 2011).

From the viewpoint of the effective planning and assessment of children's progress and the efficacy of the support provided, specific descriptions of exact, measurable objectives and support measures should be contextualized to children's everyday lives and various learning environments (Boavida et al., 2010; Christle & Yell, 2010; Räty, Vehkakoski, & Pirttimaa, 2018). In addition, knowledge about children's current achievement levels, situations, challenges, and strengths needs to be explicitly used to set goals and formulate appropriate measures (Michinowicz, McConnell, Peterson, & Odom, 1995). This kind of documentation is likely to lead to the individualization of practices (Pretti-Frontczak & Bricker, 2000) and the meeting of legal and substantive IEP requirements (Christle & Yell, 2010; Drasgow et al., 2001). To achieve these documentation aims, the language used should be specific, observable, and measurable (Rosas, Winterman, Kroeger, & Jones, 2009).

In pedagogical documents, including IEPs, the systematic follow-up and continuing development of support measures play a central role (see, for example, Wixson & Valencia, 2011). In evaluating children's progress and the effectiveness of support, the previous research highlight constant formative assessment using appropriate data collection techniques (Christle & Yell, 2010). Drasgow et al. (2001) highlight the need for the multifaceted (re)evaluation of children's progress, needs, and support as part of the revision of pedagogical documents. Moreover, the importance of coherence between sequential recordings and documents in which different contents (e.g., children's needs, objectives, and support) are explicitly linked to each other is underscored (Rosas et al., 2009). The revisions, improvements, and changes, as well as the maintained and terminated practices of support, should be explicitly indicated in revised documents (Wixson & Valencia, 2011).

Despite the need for continuity and coherence, earlier research concerning pedagogical documents has primarily entailed the cross-sectional examination of pedagogical documentation methods, while the development of the support measures in sequential documents and the chronological changes made to the contents of these children's documents over the years have been largely overlooked (for an exception, see Kurth & Mastergeorge, 2010). Moreover, in existing studies, the investigation of the contents and use of pedagogical documents, including IEPs, in early childhood settings is more infrequent than in those related to older children (for an exception, see Boavida et al., 2010; Kwon et al., 2011; Pretti-Frontczak & Bricker, 2000). Therefore, to address this research gap, we focus on the descriptions of support measures in the sequential pedagogical documents of Finnish children with SEN in ECEC. This study is based on longitudinal data. We examine the same children's sequential documents and recordings of support over approximately 3 to 6 years to ascertain how the recordings of support measures may change over time. The following are our research questions:

Research Question 1 (RQ1): What kinds of patterns of describing support measures can be identified from the sequential pedagogical ECEC documents of children with SEN over the years?

Research Question 2 (RQ2): What kinds of content-related and linguistic features are peculiar to the different patterns of describing this support?

Writing Pedagogical Documents: Current Practices

In numerous studies investigating pedagogical documents, including IEPs, in recent decades, the contents and (linguistic) forms of these documents have been found to be problematic. Generally, pedagogical documents vary remarkably in regard to quality, length, and contents (Karvonen & Huynh, 2007). They typically emphasize the descriptions of children and their challenges, referring only scarcely to pedagogical planning (Andreasson & Carlsson, 2013; Hjörne & Säljö, 2004; Isaksson, Lindquist, & Bergström, 2007). In the study by Rosas et al. (2009), half of the examined IEPs lacked relevant legal requirements. Zirkel and Hetrick (2017) found that, in particular, the evaluations and revisions of the previous IEPs were insufficiently documented. Moreover, the assessment in IEPs has been reported to be predominantly summative, focusing on the assessment of children's present skills instead of on the development of support (Andreasson & Carlsson, 2013).

In the previous research, the quality of the objectives in particular seems to have been studied thoroughly, and this is likely because their significance has been highlighted (e.g., Christle & Yell, 2010; Drasgow et al., 2001). However, in these studies, the objectives elaborated in pedagogical documents have been found to be generally poor in quality, especially concerning their measurability (Michinowicz et al., 1995; Rakap, 2015; Rubler, McGrew, Dalrymple, & Jung, 2010; Sanches-Ferreira, Lopes-dos-Santos, Alves, Santos, & Silveira-Maia, 2013). This is presumably because they were written in an imprecise and inadequate manner (Rubler et al., 2010; Sanches-Ferreira et al., 2013). The objectives are typically broad, vague, and abstract (Boavida et al., 2010; Drasgow et al., 2001; Michinowicz et al., 1995; Rakap, 2015; Yell & Stecker, 2003), and their development is not documented systematically (Espin, Deno, & Albayrak-Kaymak, 1998; Yell & Stecker, 2003). The number of objectives is typically high, possibly leading to problems with monitoring the children's progress (Boavida et al., 2010). In the study by Boavida et al. (2010), it was found that higher quality objectives (regarding measurability and functionality) were more likely related to autonomy skills. Moreover, the objectives of children with disabilities were more likely of high quality than the objectives of children without disabilities. However, in Rakap's (2015) study, such differences were not found.

The descriptions of the interventions and support measures are studied less frequently than other document contents. Earlier studies show that the descriptions of individualized instruction are not documented systematically (Espin et al., 1998; Yell & Stecker, 2003) and that the connection between learning objectives and instruction planning is weak or nonexistent (Blackwell & Rossetti, 2014; Rubler et al., 2010). In addition, support measures are described predominantly using imprecise language and exclude the specific allocation of responsibilities related to the provision of support (Räty et al., 2018; Rubler et al., 2010). Methods are also focused on efforts to improve children's skills instead of on environmental, organizational, or pedagogical aspects of support (Isaksson et al., 2007).

Few researchers have analyzed pedagogical documents based on a *longitudinal design*. Studying the sequential IEPs of children with autism from kindergarten to Grade 9, Kurth and Mastergeorge (2010) found that approximately 50% of the annual goals in IEPs were repeated in sequential documents. This repetition occurred approximately 2 or 3 years in a row, depending on the objectives, although goals could be repeated up to 9 years in a row. They also found that younger children—those in kindergarten—had fewer adaptations than those in the upper grades, whereas teachers reported comparatively less frequently on children's progress in later grades. However, teachers in inclusive settings reported progress more often than those in non-inclusive settings.

To summarize, the clear discrepancy between theoretical understanding and actual practice regarding high-quality pedagogical documents is evident. Yell and Stecker (2003) describe how, at its worst, "the IEP, in effect, becomes a procedural compliance exercise with little or no relevance to the teaching and learning process" (p. 74). Moreover, there is a danger that pedagogical documents act primarily as administrative rather than pedagogical tools (Andreasson, Asp-Onsjö, & Isaksson, 2013) or aim primarily to meet legislative requirements without having an educational value (Christle & Yell, 2010; see also Pretti-Frontczak & Bricker, 2000; Yell & Stecker, 2003).

Method

Setting

In this study, we investigate the pedagogical documents drafted in Finnish ECEC. Finnish ECEC consists of services for children from birth to 6 years of age and preprimary education (4 hr a day) in the year preceding compulsory comprehensive school. Both ECEC services and preprimary education are founded on the Nordic Educare model, based on which teaching, education, and care (while parents work or study) are daily interlinked activities that are provided in one location (either kindergarten or family daycare; see Onnismaa & Kalliala, 2010).

All children participate in compulsory preprimary education at the age of 6. However, regarding other ECEC services, the participation rate of Finnish children is relatively low compared with the international rate: Only 74% of 4-year-olds participated in ECEC in 2015, whereas the average for Organisation for Economic Co-operation and Development (OECD; 2017) countries was 87%. In addition to being compulsory, preprimary education is also free of charge, but other ECEC services are subject to charge (maximum payment: €289 per month). However, the charges are reduced gradually based on family income and whether the family has many children, and low-income families are released from payment entirely. In 2016, this reduction applied to 18% of families (National Institute for Health and Welfare, 2017).

Regarding the arrangements for educational support in Finnish ECEC and preprimary education, a shift toward the application of response to intervention (RTI) ideas (see Buysse & Peisner-Feinberg, 2013) and the three-tiered pyramid model (see Fox, Carta, Strain, Dunlap, & Hemmeter, 2010) has occurred in recent years. Since 2010, the three-tiered model has been applied in Finnish primary and preprimary education as an administrative framework for providing support (regarding the Finnish RTI, see Björn, Aro, Koponen, Fuchs, & Fuchs, 2016). In this model, three tiers of educational support—general (Tier 1), intensified (Tier 2), and special (Tier 3)—are presented. The Finnish system emphasizes open-to-all educational support, which is a prerequisite-free provision that is granted instantly once children's needs are identified (Finnish National Board of Education, 2016, 2018). Therefore, from the first tier, instant pedagogical and instructional rearrangements are available in children's own ECEC classes in keeping with the ideas of the earliest possible intervention and preventive support.

However, due to the differing legislative bases, in the Finnish ECEC, the role of RTI and the tiered model is unestablished. Preprimary education is regulated by the Finland Basic Education Act (628/1998) and the core curriculum for preprimary education (Finnish National Board of Education, 2016), which indicate the use of Finnish three-tiered model explicitly. However, other ECEC is regulated by the Early Childhood Education Act (540/2018) and the core curriculum for early childhood education (Finnish National Board of Education, 2018), which fails to define the exact ways in which educational support should be provided. Therefore, regarding the application of RTI, the Finnish educational system currently reflects the international situation: It is said to be more established in primary and secondary school than in early childhood settings (The Division for Early Childhood of the Council for Exceptional Children [DEC], National

Association for the Education of Young Children [NAEYC], & National Head Start Association [NHSA], 2014).

In addition to the national legislation and regulations governing ECEC and preprimary education, municipalities in Finland are obligated to localize the national curricula at the municipal level by designing local curricula, which are normative within particular municipalities. In these local policy documents, the multiple municipal directions can be set (e.g., whether to also apply the RTI framework to ECEC), and the national regulations are elaborated in detail (e.g., specific forms of pedagogical documents are provided). Finnish ECEC services including preprimary education are increasingly arranged in an inclusive manner. For example, in 2016, only 8% of Finnish municipalities reported that they had segregated ECEC classes for children with SEN (National Institute for Health and Welfare, 2017).

In Finnish ECEC, the drafting of pedagogical documents has a long tradition, and the practices are governed by laws, curricula, and municipal regulations. As contrary to international practice, in Finnish ECEC, every child, irrespective of SEN, has an individualized pedagogical document. The aim of these documents has traditionally been to take into account children's individual strengths, interests, and opinions in planning high-quality general ECEC. An individualized pedagogical document called *an ECEC plan* is drafted for children below 6 years of age. This practice has been outlined in the ECEC steering policy document since 2004 and has been mandatory by law since the 2015 legislative reform. In preprimary education, the law obligates the drafting of *a preprimary plan* for children with SEN, although it is enabled for all children. In practice, all children in preprimary education typically have individualized preprimary plans, as municipalities have made it a mandatory component of the local curricula.

ECEC and preprimary plans typically include the planning of educational support at the general level. However, when intensified or special support is provided, additional pedagogical documentation is conducted. According to the laws and curricula, in Tiers 2 and 3, children's preprimary plans need to be either (a) completed with additional support-centered contents or separate attachments (plans for intensified support) when children receive intensified support or (b) replaced entirely by support-focused pedagogical documents, when children receive special support (Finnish National Board of Education, 2016).

In other ECEC services, the practices of documenting the educational support of children with SEN vary. In some municipalities, the RTI model with three tiers is implemented, and then the abovementioned practices of preprimary education are typically followed. However, the practices can also be followed partially, for example, using an individual ECEC document to plan support for all children, even though the RTI model and three tiers are used as the administrative framework. In the municipalities in which the RTI model with tiers is not implemented in ECEC, the individual ECEC plan is typically used universally.

ECEC teachers are generally the ones who draft the documents. In preprimary education, the ECEC teachers with preprimary education qualifications draft the pedagogical documents used in their preprimary classes. Furthermore, in other ECEC services, when children have SEN, early childhood special education teachers typically participate in at least the planning of children's support and the drafting of documents. In addition, family daycare nurses, in cooperation with ECEC teachers or early childhood special education teachers, draft pedagogical documents for children in family daycare.

There seems to have been a rapid turnover of writers of children's pedagogical documents over the years. In Finnish ECEC and preprimary education, children typically experience multiple transitions and other structural changes in their ECEC classes during their years in early childhood education services. Because of the predominant practice of arranging ECEC based on age groups, children in kindergarten can, for example, move into new groups at the beginning of new terms as they grow older. Moreover, staff can also change classes. In both cases, the educators who write the children's pedagogical documents may also change. According to the data

collected for this research, the same educator had not usually written more than two sequential documents for the child. Therefore, each child's pedagogical documents had typically been written by at least two educators.

Sample

The research data were collected from 23 Finnish preprimary education classes during the 2015-2016 school year. According to Gobo (2011), social research typically focuses on "the social significance of the sample instead of a statistical logic" (p. 2). Therefore, as Finnish municipalities have a great deal of independence in localizing regulations related to pedagogical writing (e.g., making drafts of certain documents mandatory and providing forms of pedagogical documents), purposive sampling was used to achieve the maximum variation (Patton, 2015), considering the municipalities and the preprimary education classes within them. The selection criteria for municipalities included varying pedagogical practices in arranging educational support for children, geographical locations, and sizes. Consequently, five Finnish municipalities participated.

The ECEC administrators in the municipalities selected the participating preprimary classes. The researcher instructed the administrators to seek participating classes from different parts of the cities and municipalities to achieve the most diverse data possible. They were also instructed to take into account the geographical locations of the classes and the potential variations in the children's socioeconomic backgrounds. In addition, administrators were asked to invite classes that, to their knowledge, varied in regard to their pedagogical practices. As a result, 23 preprimary education classes participated with a variance of one to 10 classes per municipality.

For preprimary education classes, we applied two kinds of sampling techniques. In 10 of the participating classes, all the children were considered participants, irrespective of their SEN. However, because the specific purpose of the study was focused on the documentation of support measures, in 13 classes, we asked only the children who had identified SEN (either intensified or special support, Tiers 2 and 3) to participate. Patton (2015) describes this kind of selection as *group characteristics sampling*, which is aimed at a "select specific information-rich group" (p. 267). Consequently, we collected the pedagogical documents of 108 Finnish children receiving special (Tier 3, $n = 8$), intensified (Tier 2, $n = 21$), or general support (Tier 1, $n = 79$). In this sample, the number of children receiving either intensified or special support is purposefully overrepresented, approximately 27% of children in total. In Finnish ECEC, only 7% of children received either intensified or special support in 2016 (National Institute for Health and Welfare, 2017).

We followed the ethical guidelines for data collection (Christians, 2011), which include protecting the anonymity of the children and municipalities throughout the course of the study. We requested written research permission from the municipal authorities and written informed consent from the children's guardians. We also informed these guardians and the teachers of the preprimary classes about their right to withdraw from the study at any time. In 10 of the 23 classes that participated, we requested research permission from all the guardians, irrespective of the children's identified SEN. In the other 13 classes, we requested permission solely from the guardians of the children with SEN (intensified or special support) to enable the collection of sufficient data about these children.

According to the curricula for ECEC (Finnish National Board of Education, 2018) and preprimary education (Finnish National Board of Education, 2016), pedagogical documents should be revisited, at the very least, once a year or whenever children's needs require it. In practice, documents are typically drafted at the beginning of fall and assessed at the end of spring. However, the pedagogical documents of children with SEN are typically revisited more often than those of children without SEN. In the research data, the frequency with which the

Table 1. The Research Data ($N = 257$).

Name of the document	*n*
ECEC plan	172
Preprimary education plan	48
Preprimary education plan including planning for intensified support	11
Additional plan for intensified support	18
IEP	8

Note. ECEC = early childhood education and care; IEP = individual education plan or program.

pedagogical documents were revisited varied substantially, as some children's documents were revisited up to 5 times a year, while others were revisited only once.

Instrumentation and Data Collection

The purpose of this study was to investigate the patterns of writing about support measures for children with SEN. Research data were selected from the broader data set ($n = 108$) according to the following criterion: The child had at least 2 years of documented history in ECEC, that is, there were two pedagogical documents drafted in ECEC and preprimary education (typically, an individual preprimary education plan and ECEC plan, or substitute documents). This criterion was applied to obtain longitudinal data.

A second purpose was to investigate the descriptions of the support measures for children receiving general, intensified, or special support. An additional criterion was applied to the data set with at least 2 years of documented history in ECEC: The child had learning, behavioral, or developmental challenges, which were described in the document drafted during the preprimary year. To be identified as long lasting, such challenges needed to have been mentioned in at least one pedagogical document prior to the start of preprimary education. Challenges varied from more severe, wide-ranging developmental difficulties, such as an intellectual disability or particular language impairment, to more specific and milder challenges, such as holding a pencil properly or resting peacefully during naptime. An officially diagnosed condition was not required, as this is not a prerequisite for receiving educational support in Finland.

The final sample consisted of 64 children's pedagogical documents ($n = 257$). Approximately 72% ($n = 46$) received general support (Tier 1), approximately 22% ($n = 14$) received intensified support (Tier 2), and approximately 6% ($n = 8$) received special support (Tier 3) during their preprimary year. The number of documents studied per child varied from three to 10, with the average number per child being four ($M = 4.02$). The data are presented in Table 1.

After identifying all cases of challenges in each document, we identified the recordings of support measures, pedagogical practices, and their related assessments. Each child's individual challenge formed a separate case, such that the challenge was the basic unit of analysis. Challenges were analyzed in sequential documents. For example, if a child was described as having challenges with (a) vocabulary, (b) proper pencil holding, and (c) self-regulation in the preprimary year, the descriptions of support measures, objectives, and evaluations regarding each of these challenges were studied as one case. The descriptions of measures, assessments, and evaluations written in any parts of the documents by ECEC professionals were included. The writings of parents, children, or individuals other than ECEC professionals were not included in the investigation.

We found 164 separate cases of continual challenges in the children's documents. The number of challenges per child varied from one to eight and averaged three. The most typical challenges related to socioemotional (39% of the cases) and motoric (20%) issues, followed by challenges

of attention and concentration (16%) and language (15%). Other challenges related to self-help skills such as eating or toileting (6%), sensory impairments (2%), cognitive functioning (2%), and mathematical readiness (2%).

Data Analysis

The documents can be investigated using various methodologies and approaches (Bowen, 2009). In this study, we based our analysis of the differing patterns of writing about children's support measures on the key ideas of discursive psychology (Potter & Wetherell, 1987) and text linguistics (Halliday, 2013). In discursive psychology, reality is understood as being socially constructed through language (Potter & Wetherell, 1987). As Halliday (2013) reiterates, "language is patterned activity," especially regarding the meanings it creates (p. 56). The intensive case analysis of the sequential recordings of each child's challenge revealed three distinct features of the writing: (a) whether there were any descriptions of support in a child's sequential documents, (b) whether the support measures were changed from one recording to the other, and (c) whether the recordings presented a coherent picture of support planning over the years.

To investigate the differences in greater depth at both the content-related and linguistic levels, we applied two concepts of text linguistics to the analysis (Halliday, 2013). First, we investigated the coherence of the written information in the recordings. Coherence is a vital element of communicative text (De Beaugrande & Dressler, 1981), and it can be constructed using linguistic features, such as referencing and linking words (e.g., *thus, since*, and *in order to*). For example, we investigated how specifically the measures were justified in the recordings and whether they were revisited later. In addition, we focused on the relationships between sequential recordings with respect to content (e.g., including the same kind of support practices) and the abovementioned linguistic features that created coherence. Second, we continued the analysis by investigating the level of linguistic precision of the descriptions (i.e., the vagueness or elaborateness of the descriptions and resulting specificity of the information they offered).

Based on the observed features, the first author followed the ideas of the constant comparison method (Dye, Schatz, Rosenberg, & Coleman, 2000), creating the initial categorization based on the preliminary observations of the data. All three authors discussed, negotiated, and revisited the initial categories before deciding on the final categorization (see Goetz & LeCompte, 1981). The final categorization, including four patterns of developing support measures, was constructed by comparing the initial categories with various data extracts and other potential categories (Goetz & LeCompte, 1981). After arriving at a common view regarding the final categories, we continued the analysis by categorizing all 164 identified cases of challenges. The first and last authors both analyzed 66% of the individual cases of challenges by coding the continuity of the support measures for each case into the final pattern categories. In 94% of the cases, the authors achieved a clear consensus on the categorization of the support measures. Regarding the remaining 6% of cases, the researchers discussed the cases and concretized the criteria for the categorization in detail to decide which pattern the continuity of the support measures in question represented. For the remaining 34% of the data, the first author independently conducted the analysis and categorization, without any need to clarify the criteria for categorization.

Results

Four patterns of either disjointed or interlinked descriptions of support in sequential pedagogical documents were found: *missing, repetitious, disorganized*, and *explicit*. The key characteristics of the patterns, as well as the proportions of the cases they cover, are presented in Table 2. Next,

Table 2. Four Chronological Patterns of Developing Support Measures in Pedagogical Documents Over the Years.

Chronological pattern	Simplified description of content	Key linguistic feature	Coherence	No. of cases ($N = 164$)	% of cases
1 Missing	No descriptions	—	—	48	29
2 Repetitious	Unchanging support	Repetitious word choices, generic utterances	Relatively clear	67	41
3 Disorganized	Unconnected yet changed support	Lack of linking words, inconsistent word choices	Lacking	28	17
4 Explicit	Systematically developed support	Argumentative writing, specific utterances	Clear	21	13

each pattern is illustrated with a single chronological example from the data, demonstrating the key characteristics of a particular pattern relating to both research questions. In the examples, the children's names are replaced with pseudonyms to ensure confidentiality.

Pattern 1: Missing Descriptions of Support

Missing descriptions of support refers to the recordings (and sometimes, complete documents) in which the descriptions of support are lacking entirely. In total, 29% of the studied cases were categorized as *missing* descriptions of support. In particular, the recordings that were aimed primarily at assessing a previously written plan (typically, recordings at the end of the ECEC year) lacked the descriptions and revisions of support measures, and included only the descriptions of children and their situations. Extract 1 shows this type of *missing* support in three sequential recordings of Samuel's documents:

Extract 1: Samuel

4 years 2 mon	What the child is practicing: Seeking attention is strong: "look," "look"; would not be willing to wait for others to watch or for their own turn to speak Agreements: Practicing good manners. (*ECEC plan*)
5 years 2 mon	Observations: The need for an adult's attention is great, sometimes seeks other children's attention by fooling around. What the child is practicing: showing and controlling one's emotions (anger provokes kicking, hitting, spitting), malicious pleasure (down arrow), intentional laughter, giggling in situations where it's inappropriate (down arrow). Agreements: Showing and controlling emotions. (*ECEC plan*)
6 years 0 mon	Observations: Making contact: pushing others, blowing, "kicking" with the foot -> seeking attention. (*Preprimary plan*)

In Extract 1, in three records written during a 2-year period, Samuel is described as having various challenges regarding social skills. The records include objectives and descriptions of the situation; however, the descriptions of what adults do with and for Samuel to help him overcome the challenges are missing. Descriptions of actions (e.g., "showing and controlling of one's

emotions"; "malicious pleasure") and agreements with parents (e.g., "showing and controlling emotions") describe the objectives for Samuel without describing adults' roles in promoting the achievement of objectives. It is notable that although support is mentioned in the two later recordings, detailed descriptions of Samuel's individual difficulties are included every time the plan is revisited.

Pattern 2: Repetitious Descriptions of Methods

Repetitious descriptions, as opposed to *missing* ones, do illustrate a plan for support. However, the descriptions are brief, nonspecific, and repeated almost identically from one recording to another. This type of writing was the most dominant, as 41% of the studied cases were categorized as having this pattern. The key features of the *repetitious* pattern of describing support are illustrated in Extract 2, in which Emma's seven sequential recordings from an almost 5-year period are presented. In every record, Emma is described as having challenges related to her tendency to withdraw from social situations in ECEC:

Extract 2: Emma

1 year 9 mon	Observations: Shyness in new situations. Is wary of new people; however, gets used to them quickly and trusts adults. Objectives/measures: Is encouraged to play with others. Is allowed to take her time to know them. (*ECEC plan*)
2 years 3 mon	Observations: Is still shy toward new adults, but becomes more and more lively all the time. Is also a bit shy in new situations. Objectives/measures: Is encouraged to play with others. (*ECEC plan*)
4 years 4 mon	Measures: Encouragement and cheering when needed. (*ECEC plan*)
5 years 2 mon	Observations: Participates in playing with others, but sometimes drops to the background in a big group. Sensitive, but tearfulness has decreased. Cautious in new situations. Objectives/measures: Is cheered in order to encourage her to play with others. (*ECEC plan*)
5 years 4 mon	Evaluation: Does not take a back seat anymore, even in a big group. Also plays in a group other than the one her sister is in. In conflict situations, comes and tells an adult about being "wronged." Cries less and less frequently. Has gained more courage, although sometimes shy in certain situations—e.g., singalong gatherings with the entire daycare center. Measures: Is encouraged to also participate in unfamiliar situations. (*ECEC plan*)
6 years 2 mon	Observations: Observes. (*Preprimary plan*)
6 years 6 mon	Evaluation: Everything okay. (*Preprimary plan*)

In Extract 2, similar descriptions are repeated yearly without changing the content or developing the approach remarkably (e.g., "is encouraged to play with others," "is encouraged," and "encouragement and cheering when needed"). Support is mentioned briefly using vague expressions ("is encouraged," "is allowed," and "is cheered") and a maximum of two sentences. Recordings do not specify what should actually be done with Emma or how professionals should work concretely to help her participate. Similarly, the recordings contain no explicit justification for approaching withdrawal with encouragement. In the last two recordings, the descriptions of support are missing completely. Support is also described without contextualizing Emma's situation,

such as what does encouragement means to her alone, in the group situation, or in the types of unfamiliar situations that Emma faces. Consequently, the manner of implementing the support remains unclear.

Linguistically, the connection between sequential recordings is lacking, as the evaluation of the planned support (mainly, encouragement) is not illustrated. In its entirety, the situation for Emma seems to remain quite stable. Emma is described as having withdrawn from the age of 1 year and 9 months. However, at the age of 6 years and 6 months, the situation has changed remarkably (i.e., "everything okay"). In the last recordings of Extract 2, the efficacy of the support is presented implicitly and evaluated when Emma is described as moving in the desired direction regarding her development and learning (e.g., "does not take a back seat anymore, even in a big group," "plays in a group other than the one her sister is in," and "has gained more courage, although sometimes shy in certain situations—for example, singalong gatherings with the entire daycare center"). Consequently, the slightly revisited plan for helping Emma participate is introduced ("is encouraged to also participate in unfamiliar situations"), and in that plan, the word *also* implies a change: From that point onward, encouragement will be provided in new situations. However, the object of the evaluation is Emma and changing her. The need for encouragement becomes justified primarily by Emma's actions, not by the need to improve the support.

Pattern 3: Disorganized Descriptions of Support

In a *disorganized* pattern, support is typically described in a precise and unambiguous manner. However, this is not as systematical feature as the linguistic features in the other patterns are as the support can also be unambiguous and general. The *disorganized* features of documenting support were found in the 17% of the cases studied. Unlike the previously presented patterns, the descriptions of support change over the years. However, the connections between sequential recordings are absent, and the logic of changing the support practices, methods, and/or agreements is missing at both the content and linguistic levels. Therefore, the *disorganized* pattern gives an incoherent view of support from the viewpoint of continuity. This appears in the following recordings of the third extract, in which Sebastian is described as having diverse challenges related to socioemotional well-being and behavior:

Extract 3: Sebastian

2 years 9 mon	Objectives: Methods for showing one's emotions are practiced—is guided to say, "Now I feel angry." Agreements: Naming of emotions is practiced—e.g., teddy bear cards. (*ECEC plan*)
2 years 11 mon	Objectives: clear boundaries, consistency. Agreements: consistency; respecting others; waiting one's turn and sharing things; equity. (*ECEC plan*)
4 years 0 mon	Evaluation: It is important to pay attention to the environment; adult support is important for Sebastian; green and red anger cards are used to support the showing of one's emotions; setting boundaries is important -> gentle positive guidance; Sebastian is supported in regulating his own boundaries. (*ECEC plan*)
4 years 6 mon	Observations: He might test adults, and therefore, it is good that the group has good rules, as well as clear and consistent practices. It is, therefore, important that an adult is near and gatherings are motivating to Sebastian. For him, small-group activities are particularly good because there are fewer children. (*ECEC plan*)

4 years 9 mon	Evaluation: Sebastian is able to concentrate better in the group gatherings; every now and then, he is reminded of the thumbs-up practice when he has something to say. (*ECEC plan*)
5 years 9 mon	Observations: Daily transitions, waiting, and supervised situations are difficult; hard to concentrate. Objectives: Help with concentration during small-group activities. Sebastian is cheered and motivated to participate. Agreements: an adult participates in playing in order to prevent the play from going wild. (*ECEC plan*)
6 years 0 mon	Objectives: Nice memories and relationships with friends, and the ability to concentrate will improve. Methods: is trained daily by proceeding to one instruction at a time if needed; personal, quiet working space (with adult support). (*Preprimary plan*)
6 years 2 mon	Follow-up: Transition to lunch with a special assistant and another boy and sitting next to an adult. (*Preprimary plan*)
6 years 4 mon	Follow-up: A lot of personal support for calming emotions and/or improving alertness. (*Preprimary plan*)

In this extract, Sebastian's recordings illustrate how the connections between various recordings are weak, both within a single recording and between recordings. The recordings bounce from one matter to the other, due to the manner of changing the support measures and describing varying agreements without explicitly assessing their efficacy or citing earlier recordings. Other cohesion is also lacking. For example, new support measures are often introduced (e.g., teddy bear cards in the first recording, red and green anger pictures in the third, and a special assistant in the eighth) but are not revisited. In fact, practices in the preceding recording are typically not mentioned again after they are introduced. Therefore, information about whether the newly introduced methods are meant to accompany or replace the previous ones is missing.

Similarly, when the assessment is written, it typically focuses on introducing new and changing methods (e.g., "green and red anger cards are used to support the showing of one's emotions" and "transition to lunch with a special assistant and another boy and sitting next to an adult"). The actual assessment of the functionality of the support measures and the justifications for new ones is typically lacking. As with the previous types of writing, the aim of the assessment is sometimes to evaluate the child as an individual in different learning environments (e.g., "Sebastian is able to concentrate better in the group gatherings"). The *disorganized* characteristics are also evident when Sebastian's challenges are described. At the age of 2 years and 9 months, Sebastian is described as having challenges related to naming emotions. Thereafter, the main challenges seem to be his lack of concentration and, sometimes, his ability to identify, understand, and control emotions. The challenges and objectives are, therefore, described differently in sequential recordings without defining the reasons for changing them.

Although the connections and coherence of the writing are typically missing at both the content and linguistic levels, the linkage between different kinds of information is implied at times. In Extract 3, at the age of 5 years and 9 months, the description, "adult participates in playing in order to prevent the play from going wild" implies the goal of the support: to prevent playing from becoming wild. At the age of 4 years and 6 months, the linkage between observations ("he might test adults") and practice ("and, therefore, it is good that the group has good rules, as well as clear and consistent practices") is described. Similarly, the descriptions vary according to how they contextualize where or when a certain support measure is provided. While some expressions define the place of the support (e.g., "transition to lunch with a special assistant"), others remain very general regarding the descriptions of practices

(e.g., "help with concentration during small-group activities") and omit the child's individual situation and group context from the planning.

Pattern 4: Explicit Descriptions of Support

In the *explicit* patterns, support is evaluated and developed systematically. The pattern is the most infrequently found category, however, as the features of *explicitness* in documenting support were identified in only 13% of the cases studied. In *explicit* patterns, the recordings refer to the preceding recordings and documents that are cited *explicitly* sometimes. Descriptions are typically detailed, contextualized, and linguistically unambiguous. They are also often precise, even though the precision varies. In the fourth extract, we evaluated and developed the support planned during a period of 2 years and 5 months for Anna, who has sensory integration challenges:

Extract 4: Anna

4 years 4 mon	Strengths and needs: Dresses by herself, but is attentive about clothing—that it not be tight, etc. (*ECEC plan*)
5 years 0 mon	The main challenge: challenges in dressing situations. Support measures at home: dressing situations become calmer when Anna herself chooses clothes from two options. Methods: Anna can choose between two options, if this is possible; Anna is cheered on by others to dress by herself; she can readjust the clothes if they are tight; pictures as a help in dressing situations; anticipation of what needs to be worn; adult support and guidance in dressing situations. (*plan for intensified support*)
5 years 7 mon	Evaluation: Anna has developed very significantly during autumn 2014. Getting dressed has become much easier, and hardly any temper tantrums have occurred. Anna also clearly tolerates unpleasant sensations better, such as clothes that feel unpleasant or doing her hair up in a ponytail. However, challenges in sensory integration still exist, but they stand out mainly in auditory sensations or when things feel unpleasant in some other way . . . Support measures have been sufficient and, for Anna, effective and practical; so, it will be of benefit to also continue using them in the future . . . We have noticed some functional practices in Anna's group that are worth continuing. Dressing situations: dressing situations need to be calm. Not too many children in the hallway . . . (continues) (*plan for intensified support*)
6 years 0 mon	Evaluation: When considering Anna, attention still needs to be paid to sensitive sensations—e.g., when getting her clothes on; what feels good, what doesn't. Anna is a sensitive girl in other respects as well. Reassessment of the situation in autumn 2015 . . . Innings 2014/2015 has gone magnificently for Anna. Putting clothes on goes nicely. Intensified support is continued until autumn holiday 2015, after which the need for it (if any) is assessed. The situation has also calmed down at home. (*plan for intensified support*)
6 years 4 mon	Main challenge: sensory defensiveness. Methods: practicing emotion skills . . . choices are given, and putting on uncomfortable clothes is not forced on Anna; anticipating challenging situations is important. (*plan for intensified support*)
6 years 7 mon	Evaluation: emotion skills have strengthened, and sensory defensiveness has not been especially visible in everyday life in familiar environments and among familiar adults and children. (*plan for intensified support*)

In this extract, support is developed systematically in sequential recordings. According to the description, at the age of 4 years and 4 months, Anna "dresses by herself, but is attentive about clothing." At the age of 5 years, the support measures are related to situations in which Anna is expected to dress herself (e.g., "Anna can choose between two options, if this is possible"; "she can readjust the clothes, if they are tight"; "pictures as help in dressing situations"; and "adult support and guidance in dressing situations"). In addition, support is both evaluated and justified explicitly by illustrating how "support measures have been sufficient and, for Anna, effective and practical; so, it is of benefit to also continue using them in the future," and indicating that "we have noticed some functional practices in Anna's group that are worth continuing." The efficacy of the support is evaluated by referring to the changes in Anna's behavior within a certain specific period ("Anna has developed very significantly during autumn 2014"). Anna's challenges are specified in relation to the specific context within which they appear (e.g., "however, challenges in sensory integration still exist, but they stand out mainly in auditory sensations or when things feel unpleasant in some other way").

In *explicit* descriptions of support, information about children's situations is used as evidence to evaluate the efficacy of support measures instead of evaluating the children only. In addition to evaluating past and present situations, the future is explicitly planned, and the prospective reevaluation of Anna's support is scheduled ("intensified support is continued until autumn holiday 2015, after which the need for it [if any] is assessed"). The accomplishment of set goals is also described *explicitly*: at the age of 6 years ("putting clothes on goes nicely" and "the situation has also calmed down at home") and again at the age of 6 years and 7 months ("emotion skills have strengthened, and sensory defensiveness has not been especially visible in everyday life in familiar environments and among familiar adults and children"). This kind of *explicit* writing increases the coherence of the text, as it connects the components of a single recording and the earlier recordings at the content-related and linguistic levels.

Extract 4 is also an example of the elaborate and unambiguous way of describing support measures (e.g., "Anna can choose between two options, if this is possible"), although more vague and imprecise descriptions are included as well (e.g., "adult support and guidance in dressing situations" and "practicing of emotion skills"). The agreements and evaluations regarding support and Anna's home situation are also described (first, "dressing situations become calmer when Anna herself chooses clothes from two options" and later, "the situation has also calmed down at home").

Discussion

In this research, cumulative pedagogical documents were studied, based on a longitudinal design. We aimed to identify the patterns of describing support measures in sequential documents and the content-related and linguistic features that are peculiar to these patterns. In the analysis, four chronological patterns of describing the support measures over the years were found: *missing* (29%), *repetitious* (41%), *disorganized* (17%), and *explicit* (13%). The findings show that with the exception of the last pattern (*explicit*), the development, justification, and validation of the support measures systematically over time were lacking in 87% of the cases, and the descriptions of support were imprecise, incoherent, or nonexistent. However, when support was carefully revisited, further defined, and/or regenerated, and its efficacy was assessed in sequential recordings, as was done in the last pattern of *explicit* descriptions, the child's documents exhibited a coherent continuity.

The sequential descriptions of support were most typically *repetitious* (41%), meaning that recordings of children's support remained more or less the same. It is noteworthy and alarming that in 70% of the cases (both the *missing* and *repetitious* patterns), children's support measures and interventions were not developed over the years. Kurth and Mastergeorge (2010) suggest that

this may be due to numerous underlying factors, including the possibility that teachers have made an informed interpretation of the contents as being valid and meaningful over time. However, it is possible that the contents are not evaluated systematically, despite their continued use. As children's support should be developed systematically, the main benefit of the *disorganized* pattern, compared with the *missing* and *repetitious* ones, is the active development of support measures and interventions. This suggests that the development of the *disorganized* pattern might be deliberate. However, when support measures are changed randomly without fitting them *explicitly* to children's needs and assessment data, it is impossible to say whether these coincidental changes to support measures are any better than stagnant measures that remain the same for years, especially if they have been decided consciously.

The results of this study confirmed what is known currently about varying, inconsistent, and vague documentation practices (see, for example, Karvonen & Huynh, 2007; Räty et al., 2018; Rubler et al., 2010; Sanches-Ferreira et al., 2013) and about focusing on describing children instead of pedagogy (see Andreasson & Carlsson, 2013; Hjörne & Säljö, 2004; Isaksson et al., 2007). Moreover, the connections between children's needs, objectives, methods, and evaluations were unclear typically, which coincides with previous research findings (Blackwell & Rossetti, 2014; Rubler et al., 2010).

The vague practice of documenting support measures is problematic in several ways, as the reader must interpret how to implement the support concretely. Exact expressions of measures (e.g., "a little object in hand to play in shared gatherings") direct pedagogical practices more carefully and univocally than vague expressions (e.g., "support for attention and concentration"). When the descriptions of support are predominantly missing or lack systematic development, the actual aim of the pedagogical documents regarding the planning of systematic support measures is left unrealized. Consequently, the possibility to exploit the benefits of pedagogical documents is missed (see also Blackwell & Rossetti, 2014). Moreover, in keeping with the principles of RTI (see Buysse & Peisner-Feinberg, 2013), the reliable evaluation of support and children's learning is difficult when objectives and methods are described ambiguously (see also Michinowicz et al., 1995; Räty et al., 2018). In the studied documents, when any evaluation was documented, it focused predominantly on the assessment of an individual child without explicitly evaluating the efficacy of the support measures or using evaluation data to revise objectives and measures. This observation coincides with the previous research findings, which have shown that the evaluations are the weakest parts of the documents (Zirkel & Hetrick, 2017) and that educators tend to document mainly summative and detached assessments of children (Andreasson & Carlsson, 2013).

Study Limitations

We investigated in depth the patterns and characteristics of written records about support measures of children with SEN. However, the characteristics of the design and the research context may limit the transferability of the results. The data included the documents ($N = 257$) of 64 children with SEN, which may be considered a small sample. In addition, due to the significant variance in the practices of providing ECEC services, all municipal and class-related variations in practices are unlikely to be included in the data. To meet these limitations, our sampling method aimed to collect sufficient data to capture the known variations in the phenomena of interest. According to Gobo (2011), such an approach can be defined as highlighting the "social significance of a sample" (p. 2). In keeping with the discourse analytical tradition (see, for example, Edwards & Potter, 1992), the document data used in this study are naturally occurring, which is understood as a feature that increases the reliability of the results because the researcher has not influenced the contents of the data.

In addition, the Finnish context needs to be taken into consideration when discussing the transferability of the results; this includes the Finnish integrated model of providing both

education and care in ECEC settings, the prerequisite-free provision of educational support, and universally drafted pedagogical documents. It must also be noted that Finnish ECEC and preprimary education are based on an internationally divergent implementation of RTI (e.g., Finnish RTI as an administrative framework vs. United States RTI as a specific instruction for supporting children; see Björn et al., 2016). Despite these limitations, the study can offer new insights into documenting support measures in sequential pedagogical documents related to early intervention and RTI practices in Finland, the United States, and internationally.

Implications for Practice and Future Research

Based on these results, it is questionable whether the studied documents meet the overall aim of pedagogical documents—that is, to develop meaningful, suitable, and research-based interventions and support for children. In general, the results highlight the need for more profound discussion and internalization of the key aims of pedagogical documents. This need has been indicated in several other studies over the years, yet remains relevant today (e.g., Andreasson et al., 2013; Rosas et al., 2009). In particular, the missing descriptions of support seem to reflect the fundamental idea of describing a problematic child as the initial aim of the documents. Therefore, pedagogical documents turn into reports or statements of children's problematic situations. As Andreasson and Carlsson (2013) state, "(i)t is hard to see how children could benefit from these descriptions of their shortcomings and failures" (p. 62). Conversely, other patterns that include pedagogical planning, especially the *explicit* type, reflect the understanding of a pedagogical document as a plan and as an instrument for making agreements and taking responsibility for systematic support. In such cases, the connection between the evaluation of the child's progress and the revision of the plan are closely interlinked (see, for example, Etscheidt, 2003). Based on intervention studies (e.g., Boavida, Aguiar, & McWilliam, 2014; Poppes et al., 2002; Pretti-Frontczak & Bricker, 2000), it has been found that when educators are trained to write appropriate IEPs, the quality of the contents increases; therefore, training for educators should be considered.

In studying pedagogical documents, the unpredictability of their later use needs to be taken into account. This means that although the documents orient educational practices, they are also realized in practice by the professionals who use them (see also Yell & Stecker, 2003), resulting in practices and documented plans that are not automatically similar. Further research is needed into how documentation and the actualization of planned support are interconnected with children's learning and development. The previous research has given some indicators that the link between documentation and the practice of supporting children is typically weak (see, for example, Kwon et al., 2011; Lynch & Beare, 1990; White, Garrett, Kearns, & Grisham-Brown, 2003). When written documents are investigated, there seem to be inconsistencies between theory, recommendations, and the actual documentation practices, and this disconnect can also be found in everyday ECEC practices and the support offered to children with SEN.

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A Systematic Review of Phonological Awareness Interventions for Latino Children in Early and Primary Grades

Xigrid Soto[1], Arnold Olszewski[2], and Howard Goldstein[1]

Abstract

This article summarizes the findings of a systematic review of 15 group and two single-subject experimental design studies that evaluated the effectiveness of phonological awareness interventions for dual language learners (DLL) in preschool through second grade. Studies were evaluated using a *Consumer Reports*-like rating system. Each study was rated on quality indicators for design characteristics, measurement and reliability, evaluation of treatment effects, and external validity. The effects of phonological awareness interventions for Latino children who are DLL in the early and primary grades are promising, although the studies' results are tempered by conceptual limitations. Most studies demonstrated acceptable design characteristics and implementation fidelity. Few studies included measures of social validity and consumer satisfaction. Although the review did not identify a single treatment approach to be superior, preliminary evidence suggests that children can benefit from phonological awareness instruction that is explicit and allows for multiple response opportunities. The results of this review also indicate that children who are DLL benefit from bilingual phonological awareness instruction without detracting them from acquiring English phonological awareness skills.

Keywords

dual language learners, phonological awareness, emergent literacy, early childhood

Introduction

Children's path to reading begins with strong early literacy skills that include phonological awareness or the manipulation and synthesis of spoken words at the word, syllable, and phonemic levels (e.g., rhyming, blending, segmenting, elision; Storch & Whitehurst, 2002). Children's phonological awareness skills, in conjunction with their alphabet knowledge skills, enable them to apply the alphabetic principle to decode unfamiliar words. Young children with poor phonological awareness skills have difficulty unlocking the alphabetic principle and tend

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to be struggling readers (Byrne, 2014). Providing these children with effective phonological awareness intervention can reduce their risk of developing persisting academic difficulties (Storch & Whitehurst, 2002).

Many Latino children who are dual language learners (DLL) are at peril of falling behind their peers as only 42% of them enter kindergarten with adequate phonological awareness in Spanish or in English (Fuller, 2011). Reduced phonological awareness, combined with one or more risk factors such as low socioeconomic status, low maternal education, and limited home literacy experiences (National Research Council, 2006), place Latinos in greater jeopardy of becoming struggling readers. Despite substantial evidence that providing young monolingual children with early literacy instruction focusing on phonological awareness reduces their risk of becoming struggling readers (Ehri et al., 2001), research on effective phonological awareness intervention for young Latino children who are DLL is sorely lacking. Nevertheless, teaching phonological awareness skills to Latino children who are DLL during their early and primary grades could improve reading proficiency and academic success for this population.

The purpose of this article is to present a systematic review of the existing literature on phonological awareness interventions for Latino children in the early and primary grades. The primary aims of this systematic review are to summarize and evaluate the effects and quality of existing phonological awareness interventions applied to Latino children who are DLL. The secondary aims of this systematic review are to identify the gaps in the literature, to suggest future research directions, and to provide practitioners with guidelines for delivering effective phonological awareness interventions for Latino children.

Phonological Awareness Instruction for Latino Children Who Are DLL

When evaluating the quality and effects of viable phonological awareness interventions for Latino children who are DLL, an essential question is, "What is the best method for providing phonological awareness instruction to these children?" There is growing evidence that Latino children who are DLL benefit from some of the same phonological awareness instructional strategies as their monolingual peers (Castro, Páez, Dickinson, & Frede, 2011). Both Latino children who are DLL and monolingual children respond well to phonological awareness instruction that is focused and explicit, provides multiple response opportunities, and follows a systematic developmental scope and sequence (Ehri et al., 2001). However, applying these strategies without considering the unique language needs of children who are DLL is insufficient (Castro et al., 2011), as it fails to acknowledge our contemporary understanding of bilingualism. Latino people who are DLL are not simply two monolinguals in one, but rather individuals whose experiences with their two languages impact their learning (Bialystok & Feng, 2011). There is evidence supporting a bidirectional relationship between phonological awareness skills in their two languages, with children who have high phonological awareness skills in their first language also exhibiting high phonological awareness skills in their second language (Anthony et al., 2011). There also is evidence that the nature of a language influences the ease of phonological awareness tasks (Pollard-Durodola & Simmons, 2009). Because children who are DLL experience two languages, it is important to be cognizant of the differences between their two languages, and the potential influence that this difference plays in their phonological awareness acquisition. Adequate phonological awareness instruction for Latino children, therefore, needs to consider the following: (a) the relation between children's phonological awareness skills across their two languages, (b) the similarities and differences between English and Spanish phonological awareness acquisition, and (c) how to best assess dual phonological awareness skills in Latino children to measure the effects of intervention.

Interlanguage relations of phonological awareness skills. Latino children's Spanish and English phonological awareness skills are highly interrelated; those with high Spanish phonological

awareness skills are also likely to exhibit high English phonological awareness skills (Dickinson, McCabe, Clark-Chiarelli, & Wolf, 2004; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; López & Greenfield, 2004). This theoretical finding is supported by growing evidence that Latino children who are DLL receiving bilingual phonological awareness interventions make gains in both their Spanish and English phonological awareness skills (Durán, Roseth, & Hoffman, 2010). However, children who are DLL and receive phonological awareness interventions in English make gains in English phonological awareness skills, but many fail to catch up to their monolingual peers (Castro et al., 2011). Providing young Latino children who are DLL with phonological awareness interventions that support their acquisition of phonological awareness skills in their two languages has the benefit of promoting their biliteracy and bilingual skills, as well as improving their employment and social opportunities as they transition to adulthood (Bialystok & Feng, 2011).

Differences and similarities of English and Spanish phonological awareness. Delivering interventions for Latino children who are DLL that support their acquisition of phonological awareness in both languages requires an understanding of the linguistic differences between English and Spanish (Pollard-Durodola & Simmons, 2009). Directly translating phonological awareness curricula from English to Spanish without considering the differences between the languages reduces the adequacy of phonological awareness instruction (Peña, Bedore, & Kester, 2016). English contains many monosyllabic, consonant-vowel-consonant (CVC) words (e.g., *cat, mop, rat*). In contrast, Spanish contains primarily three- to four-syllable words, consonant-vowel-consonant-vowel (CVCV) words, and few final consonants (e.g., *l, d, n, s, r*) (Jiménez González & García, 1995). These language differences affect the ease of a phonological awareness task in each language (Anthony et al., 2011; Gorman & Gillam, 2003). In English, the manipulation of words at the sound level is vital for reading, but in Spanish, blending and segmenting words at the syllable level are most predictive of future reading (Pollard-Durodola & Simmons, 2009). Although the typical sequence of phonological awareness development in English begins with larger speech segments (e.g., sentences, compound words) and progresses to smaller speech segments (e.g., words, syllables, phonemes), the developmental progression is different in Spanish (Gorman & Gillam, 2003). In Spanish, two-syllable words are easier to manipulate than three- to four-syllable words, and compound words are the most difficult to manipulate (Anthony et al., 2011).

Phonological awareness assessment and approaches to instruction. Strong phonological awareness interventions are contingent upon assessments that accurately capture the effects of these interventions on Latino children's development of early literacy. Shortcomings in the assessments result in an obscured understanding of the effects of the phonological awareness intervention. Peña and colleagues (2016) warn against translating assessments directly from English to Spanish, as this reduces their validity. For example, an English phonological awareness assessment containing mostly monosyllabic, CVC words is inappropriate in Spanish. Thus, differences in the complexity of phonological awareness tasks in English and Spanish must be considered when constructing assessments to evaluate treatment effects validly.

Despite theories recommending the best approach of phonological awareness interventions for Latino children who are DLL, there is no empirically proven gold standard for this population. Hence, our understanding of effective phonological awareness interventions for Latino children in preschool through second grade is limited. Because phonological awareness is foundational to reading fluently, and children up to second grade are still acquiring the decoding skills to read texts, it is important to identify efficacious phonological awareness interventions for these children. A systematic review of phonological awareness interventions is needed to provide insight into the effects and quality of interventions available for children who are DLL, to provide practitioners with guidelines for phonological awareness interventions, and to guide future research.

A Systematic Review of Phonological Awareness Interventions for Latino Children

Systematic reviews allow for an exhaustive summary of the current body of phonological awareness interventions by evaluating the quality and efficacy of studies based on their design characteristics and intervention effects. A systematic review will help guide teachers and clinicians in selecting appropriate interventions for young Latino children who are DLL, and identify areas needing further research. This review extends previous reviews by including younger children (i.e., preschoolers) and by analyzing studies that have specifically evaluated the effects of phonological awareness interventions. Many of the previous systematic reviews only evaluated the findings of group design studies using effect sizes (Buysse, Peisner-Feinberg, Páez, Hammer, & Knowles, 2014). This review extends this body of literature by augmenting effect sizes with ratings of quality indicators, such as research design, measurement, and external validity. This review also expands upon previous reviews by including single-subject designs.

The following research questions were addressed:

Research Question 1: How are the experimental studies of DLL phonological awareness interventions for children in preschool through second grade distributed in terms of type of intervention, language of instruction, and grade level?
Research Question 2: What is the overall quality of studies evaluating phonological awareness interventions for Latino children who are DLL in preschool through second grade?
Research Question 3: What are the effects of phonological awareness interventions for Latino children who are DLL in preschool through second grade when categorized by type of intervention and language of instruction?

Method

Selection of Research Articles

The literature search included studies published in peer-reviewed journals from 2000 to 2017 as this reflects the surge of research focusing on Latino populations in the last two decades. Studies included in this review met the following criteria: (a) they evaluated the effects of a phonological awareness intervention, (b) they had a phonological awareness outcome measure, (c) they targeted interventions for Latino children who are DLL in preschool through second grade, (d) they separated children who are DLL from the other participants in the study, and (e) they did not include children with identified disabilities (because we still do not have enough information regarding the typical development of Spanish and English phonological awareness skills in young Latino children who are DLL).

Studies were found using the Education Resource Information Center (ERIC), PsychInfo, and Google Scholar online databases using keywords: *dual language learners*, or *English language learners*, or *bilinguals*, or *Spanish-English*, as well as one or more of the following terms: *phonological awareness, phonemic awareness, early literacy, emergent literacy*, or *reading interventions*. These search terms represent ways research journals describe interventions related to phonological awareness. In total, 13 published studies met the criteria. We also searched for specific authors and journals that routinely publish research related to DLL literacy interventions, resulting in four more articles.

Research articles were selected from scholarly journals that applied a peer review process and were reputable in disseminating research related to early reading skills. These journals varied in their target audiences, including ones targeting general and special educators, speech–language pathologists, and psychologists. Searching for studies meeting the inclusion criteria across disciplines was important as these types of professionals are the ones most likely to deliver phonological awareness instruction to Latino children who are DLL. Studies were searched in a variety of

journals, including *Early Childhood Research Quarterly, Journal of Educational Psychology, Learning Disability Quarterly, Child Development, Journal of School Psychology*, and *Exceptional Children*.

We first grouped articles by design, and evaluated 15 group design studies and two single-subject design studies. For each design, articles were divided by language of instruction: *English-only, home language*, or *both languages*. Studies were further divided into one of three types of phonological awareness instruction. *phonological awareness + alphabet instruction* included studies that combined phonological awareness instruction with teaching of alphabet letters and sounds. *Phonological awareness-only instruction* included interventions that focused only on teaching distinct phonological awareness skills. *Curriculum-based instruction* included interventions that taught phonological awareness skill in the context of other oral language and emergent literacy skills such as comprehension, vocabulary, and writing.

Criteria Rating System

This systematic review was completed using a framework for evaluating the effects and quality of interventions developed by Goldstein, Lackey, and Schneider (2014) that utilizes a set of quality indicators that are largely parallel across group and single-subject experimental designs. This framework has been used to review existing research on social skills interventions for children with Autism spectrum disorders (Goldstein et al., 2014). Individual studies were rated across four categories, as shown in Tables 1 and 2: (a) study design and internal validity (e.g, design, group equivalence; Gersten et al., 2005; Horner et al., 2005; Kratochwill et al., 2012; What Works Clearinghouse, 2018), (b) measurement features (e.g., reliability, implementation fidelity; Gersten et al., 2005; Horner et al., 2005), (c) results (e.g., effect sizes, statistical analysis, visual analysis; Kratochwill et al., 2012), and (d) external validity (e.g., setting, social validity, consumer satisfaction; Kratochwill et al., 2012). These four categories were selected because they have been well-documented as constituting quality indicators for group design (Gersten et al., 2005; What Works Clearinghouse, 2018) and single-subject experimental design studies (Horner et al., 2005; Kratochwill et al., 2012). Operational definitions for each quality indicator are presented in Tables 1 and 2. In total, 14 quality indicators were used for single-subject designs, and 15 quality indicators were used for group design studies. For both designs, a numeric rating was assigned to each quality indicator: 1 = *unacceptable*, 2 = *minimal*, 3 = *acceptable*, and 4 = *exemplary*.

Data Analysis

For each study, an average across the quality indicators was calculated (see Tables 3 and 4). An overall average of ratings also was calculated across intervention types to facilitate comparisons (e.g., all studies that used *Phonological Awareness only* instruction). Circles ranging from white to black were used to graphically represent scores for each criterion. White or partially white circles represent high ratings (i.e., white = *exemplary*, and partially white = *acceptable*) while low ratings are indicated by partially black (*minimal*) or black circles (*unacceptable*).

The authors, certified speech–language pathologists with experience conducting both group and single-subject design studies, evaluated the studies. Prior to conducting the current systematic review, they were trained on how to use the evaluation framework that is used in this study. They also completed a previous systematic review on another topic. The authors initially rated studies concurrently until their inter-rater reliability was 80% or higher. When they disagreed on one of the ratings, they discussed it with the third author until an agreement was made. For the current study, 20% of the studies were randomly selected to calculate inter-rater reliability using Cohen's kappa (Cohen, 1992), which controls for chance agreement. Inter-rater reliability was very high (i.e., Cohen's kappa = 0.904).

Table 1. Design and Measurement Quality Indicators for Group and Single-Subject Design Experiments.

Design characteristics and internal validity			Measurement features	
Criteria	Group studies	Single-subject design studies	Criteria	Both group studies and single-subject design studies
Design	1. Lack of randomized design. 2. Lack of randomized design with a large sample or randomized with a small sample. 3. Randomized design with sufficiently large sample size from a specified population. 4. Randomized design with large sample size and counterbalancing of change agents.	Experimental design set up as follows: 1. Pre-experimental design (e.g., AB or ABAC design without counterbalancing). 2. Fewer than three replications across participants. 3. At least three replications across participants. 4. At least three replications demonstrated within and replicated across at least three participants.	Measurement	1. Poor measurement scheme or definitions; or reliance solely on verbal report rather than objective measures. 2. Clear, replicable, and precise operational definitions. 3. Valid measure with clear, replicable, and precise operational definitions, with either multi-method, multisource, or blind coding. 4. Multi-method (at least two measurements used to assess the primary outcomes); multisource (sampling outcomes from two different sources, e.g., parents, teachers); blind coders; good validity.
Group equivalence	1. No demonstration of group equivalence. 2. No random assignment, with post hoc test to determine group equivalence. 3. Random assignment. 4. Matching and randomization with post hoc tests to determine group equivalence.		Reliability	1. No mention of reliability or poor or questionable reliability for measures. 2. Observational measure is inconsistent or has marginal interobserver agreement scores. Tests or instruments rely on test manual with no reliability estimates for the study sample. 3. Observational measure demonstrates high interobserver agreement. Tests or instruments have adequate reliability estimates for the study sample. 4. Observational measure provides sufficient detail to rule out effects of chance agreement and a breakdown is provided for each response category. High reliability estimates for the study sample for tests or instruments.

(continued)

Table 1. (continued)

Design characteristics and internal validity			Measurement features	
Criteria	Group studies	Single-subject design studies	Criteria	Both group studies and single-subject design studies
Comparison group	1. No control group. 2. Active control group is employed. 3. Viable alternate treatment serves as a comparison within a RCT. 4. Empirically supported alternative treatment serves as a control group within a RCT.		Implementation fidelity	1. Replication would not be possible based on the description of the treatment. 2. Includes good operational definitions of the treatment. 3. Evidence of implementation fidelity is provided as well as good operational definitions of treatment. 4. Good operational definitions of treatment are provided, procedural reliability checks are reported, and there is a manual or formal training used to reach established mastery criterion.
Attrition	1. No mention of attrition although it's clearly a threat to internal validity. 2. Attrition noted as a limitation and threat to internal validity. 3. Statistical analysis used to determine attrition did not impact the study. 4. No or low attrition is reported.			

Note. 1 = unacceptable; 2 = minimal; 3 = acceptable; 4 = exemplary; RCT = randomized control trial.

Table 2. Characteristics and External Validity Quality Indicators for Group and Single-Subject Design Experiments.

General characteristics and design		External validity	
Criteria	Both group studies and single-subject design studies	Criteria	Both group studies and single-subject design studies
Rationale	1. Rationale for study is not clear or seems unimportant. 2. Minimal empirical or theoretical context. 3. Clear and thorough literature review provides strong rationale, with either theoretical or empirical evidence. 4. Theoretical and empirical evidence indicates high importance.	Site for implementation	1. No attempt to relate findings to real world. 2. Laboratory, clinical, or segregated setting, but sufficient description to judge degree of generalizability. 3. Simulated or somewhat contrived environment. 4. High external validity with respect to everyday contexts and environments.
Robust treatment effects	1. Treatment effects lacking or questionable. 2. Weak effects for key outcomes. 3. Strong treatment effects for key outcomes. 4. Strong treatment effects with sufficient details for primary and secondary outcomes.	Participant selection	1. Unable to identify participants. 2. Meager description of participant characteristics. 3. Sufficient description of participant characteristics and selection criteria to allow replication. 4. Excellent description with high degree of generalizability.
Maintenance and generalization	1. No acknowledgment of generalization/maintenance. 2. Report some, but not impressive results of maintenance and/or generalization. 3. Meets criteria for generalization or maintenance; or some generalization/short-term maintenance. 4. Analysis of generalizations and maintenance reported; durable effects across people, settings, tasks, and such.	Consumer satisfaction with the treatment	1. No mention of consumers' satisfaction with the treatment or outcomes. 2. Some mention of consumers' satisfaction or willingness to continue the treatment. 3. Some systematic assessment of consumer's satisfaction 4. Objective assessment of consumer's satisfaction.

(continued)

Table 2. (continued)

General characteristics and design			External validity	
Criteria	Both group studies and single-subject design studies		Criteria	Both group studies and single-subject design studies
	Group design studies	Single-subject design study		
Statistical treatment	1. Inappropriate statistical analysis; sample small; high likelihood of Type I error. 2. Appropriate unit of analysis; contains sufficient detail to calculate effect sizes, power, and potential for Type I error. 3. Meets first two from above and reports effect sizes. 4. Appropriate unit of analysis; control of family-wise error; large sample; effect sizes and confidence intervals reported.	1. No effect size reported. 2. Effect size based on pre–post scores. 3. Report and interpret effect sizes for primary outcomes. 4. Report large effect sizes with appropriate analysis.		
Quality of baseline		When multiple plots or figures, most show the following: 1. Fewer than three data points or one or none of criteria met. 2. High-quality baseline for two of four criteria above. 3. High-quality baseline for three of four criteria above. 4. Meets four criteria: length of baseline appropriate; stable baseline; level warrants treatment; trend not in undesirable direction.		
Visual analysis of treatment effects		1. No reliable change in behavior demonstrated. 2. Same, for at least half of the replications. 3. Same as above, for most of the replications (e.g., three of four). 4. Outcomes: (a) Large change in level of behavior; (b) minimal overlap with baseline or clear trend in desired direction; (c) adequate length and stable data within and across conditions, replicated across all participants.		

Note. 1 = unacceptable; 2 = minimal; 3 = acceptable; 4 = exemplary.

Table 3. Evaluation of Group Design Studies.

		Design characteristics and internal validity				Measurement and reliability features			Evaluation of treatment effects				Dimensions of external validity				
Citations	Average rating	Design	Group equivalence	Comparison group	Attrition	Measurement	Reliability	Implementation fidelity	Rationale	Robust treatment effects	Statistics	Maintenance and generalization	Implementation site	Participant selection	Consumer satisfaction	Social validity	Effect sizes
English																	
PA + Alphabet instruction																	
Roberts and Neal (2004; Preschool)	2.53	◔	◔	◔	○	◔	◔	◔	◔	◕	●	●	◔	◔	●	◕	0.15
Solari and Gerber (2008; kindergarten)	2.80	◔	○	◔	○	◔	◕	◕	◔	○	◔	◕	◔	◔	●	◕	−1.21 to 0.071
Calhoon, Al Otaiba, Cihak, King, and Avalos (2006) (first)	2.40	◕	◕	◕	●	◕	◕	○	◔	◔	●	●	○	◔	○	◕	1.11
Average rating by indicator	**2.58**	**2.67**	**3.00**	**2.67**	**3.00**	**2.67**	**2.33**	**3.00**	**3.00**	**3.00**	**1.67**	**1.33**	**3.33**	**3.00**	**2.00**	**2.00**	
PA only																	
Leafstedt, Richards, and Gerber (2004; Kindergarten)	2.40	●	●	◕	○	◔	●	◕	◔	○	◔	◕	◔	○	●	◕	0.55 to 2.27
Average rating by indicator	**2.40**	**1.00**	**1.00**	**2.00**	**4.00**	**3.00**	**1.00**	**2.00**	**3.00**	**4.00**	**3.00**	**2.00**	**3.00**	**4.00**	**1.00**	**2.00**	
Curriculum based																	
Han, Vukelich, Buell, and Meacham (2014; Preschool-second)	2.33	●	●	●	◔	◔	●	◕	◔	○	◔	○	○	◕	●	◕	0.47 to 0.59
Vaughn, Cirino, et al. (2006; first)	2.87	◔	◔	◕	○	◔	◕	○	○	◔	◔	◕	◔	○	●	◕	English: 1.01/Spanish: .76
Linan-Thompson, Vaughn, Hickman-Davis, and Kouzekanani (2003; second)	2.53	●	●	●	○	○	●	○	○	◔	◕	◔	◔	○	●	◕	0.48 to 0.52
Average rating by indicator	**2.58**	**1.67**	**1.67**	**1.33**	**3.67**	**3.33**	**1.33**	**3.33**	**3.67**	**3.33**	**2.67**	**3.00**	**3.33**	**3.33**	**1.00**	**2.00**	

(continued)

Table 3. (continued)

Citations	Average rating	Design characteristics and internal validity: Design	Group equivalence	Comparison group	Attrition	Measurement and reliability features: Measurement	Reliability	Implementation fidelity	Evaluation of treatment effects: Rationale	Robust treatment effects	Statistics	Maintenance and generalization	Dimensions of external validity: Implementation site	Participant selection	Consumer satisfaction	Social validity	Effect sizes	
Both languages																	English	Spanish
PA + Alphabet instruction																		
Quiroga, Lemos-Britton, Mostafapour, Abbott, and Berninger (2002; first)	2.00	●	●	●	○	◔	●	◕	○	◔	●	●	◔	◕	●	◕	Unable to calculate	
Average rating by indicator	**2.00**	**1.00**	**1.00**	**1.00**	**4.00**	**3.00**	**1.00**	**2.00**	**4.00**	**3.00**	**1.00**	**1.00**	**3.00**	**2.00**	**1.00**	**2.00**		
PA only																		
Gerber et al. (2004; Kindergarten-first)	2.33	◕	●	◕	●	◔	◕	◔	○	◕	◕	◔	◔	◔	●	◔	0.11 to 2.16	0.046 to 0.58
Average rating by indicator	**2.33**	**2.00**	**1.00**	**2.00**	**1.00**	**3.00**	**2.00**	**3.00**	**4.00**	**2.00**	**2.00**	**3.00**	**3.00**	**3.00**	**1.00**	**3.00**		
Curriculum based																		
Barnett, Yarosz, Thomas, Jung, and Blanco (2007; Preschool)	2.64	◔	◔	◕	○	◔	◕	NA	◔	◔	◔	●	○	◔	●	◕	R^2 = .24 to .39	R^2 = .27 to .33
Farver, Lonigan, and Eppe (2009; Preschool)	3.07	○	◔	◔	○	◔	○	◔	◔	○	◔	●	◔	○	●	◔	0.02 to 0.63	0.47 to 0.83
Calhoon et al. (2007; first)	2.40	◕	◕	◕	●	◕	◕	○	◔	◔	●	●	○	◔	○	◕	−0.19	NA
Vaughn, Linan-Thompson et al. (2006; first)	2.60	◔	◔	◔	◕	◔	◕	○	◔	◔	◔	●	◔	◔	●	◕	0.07	0.73
Average rating by indicator	**2.85**	**3.50**	**3.00**	**2.50**	**4.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.50**	**3.00**	**1.00**	**3.50**	**3.50**	**1.00**	**2.50**		
Spanish																		
PA + Alphabet instruction																		
Linan-Thompson, Bryant, Dickson, and Kouzekanani (2005; Kindergarten)	2.20	●	●	◕	○	◕	●	○	◔	◔	◕	●	○	◕	●	◕	NA	−0.21 to 0.52
Average rating by indicator	**2.20**	**1.00**	**1.00**	**2.00**	**4.00**	**2.00**	**1.00**	**4.00**	**3.00**	**3.00**	**2.00**	**1.00**	**4.00**	**2.00**	**1.00**	**2.00**		
Curriculum based																		
Vaughn, Mathes, et al. (2006; first)	2.93	◔	○	◕	○	◔	◕	○	○	○	◔	●	◔	○	●	◕	0.54	0.81
Average rating by indicator	**2.93**	**3.00**	**4.00**	**2.00**	**4.00**	**3.00**	**2.00**	**4.00**	**4.00**	**4.00**	**3.00**	**1.00**	**3.00**	**4.00**	**1.00**	**2.00**		

Exemplary	Acceptable	Minimal	Unacceptable
○	◔	◕	●

Note. PA = phonological awareness.

Table 4. Evaluation of the Single-Subject Design Studies.

		Design characteristics and internal validity				Evaluation of treatment effects						Dimensions of external validity				
Citations	Average rating	Design	Measurement	Reliability	Implementation fidelity	Rationale	Robust treatment effects	Quality of baseline	Visual analysis	Statistics	Maintenance and generalization	Implementation site	Participant selection	Consumer satisfaction	Social validity	Effect sizes
English																
PA + Alphabet instruction																
Gyovai, Cartledge, Kourea, Yurick, and Gibson (2009; Kindergarten-first)	2.79	○	◔	◔	○	○	◔	○	◔	●	●	◔	◔	●	◕	Tau-*U*: 52%
Average rating by indicator	**2.79**	**4.00**	**3.00**	**3.00**	**4.00**	**4.00**	**3.00**	**4.00**	**3.00**	**1.00**	**1.00**	**3.00**	**3.00**	**1.00**	**2.00**	
PA only																
Healy, Vanderwood, and Edelston (2005; first)	1.86	●	◑	◑	●	○	○	●	●	◑	●	○	○	●	◑	Unable to calculate
Average rating by indicator	**1.86**	**1.00**	**2.00**	**2.00**	**1.00**	**3.00**	**3.00**	**1.00**	**1.00**	**2.00**	**1.00**	**3.00**	**3.00**	**1.00**	**2.00**	

Exemplary	Acceptable	Minimal	Unacceptable
○	◔	◕	●

Note. PA = phonological awareness.

Dependent Variables and Effect Sizes

The dependent variables used to measure children's gains in their phonological awareness skills varied across studies. English phonological awareness outcome measures included children's gains on the *Dynamic Indicators of Basic Early Literacy Skills* (*DIBELS*; Kaminski, Smith, & Laimon, 2002), *Individual Growth and Developmental Indicators* (*IGDIs*; McConnell, Bradfield, Wackerle-Hollman, & Rodriguez, 2012), and the Word Identification and Word Attack subtests from the *Woodcock-Johnson Test of Achievement* (*WJTA*; Woodcock, McGrew, & Mather, 2001). Studies that evaluated Spanish phonological awareness outcomes also included assessments such as the Spanish version of the *Comprehensive Test of Phonological Processing-2* (*CTOPP-2*; Wagner, Torgesen, Rashotte, & Pearson, 2013) and the Spanish version of the DIBELS, the *Indicadores Dinámicos del Éxito en La Lectura* (*IDEL*; Baker, Cummings, Good, & Smolkowski, 2007).

Effect sizes were calculated for both the group and single-subject design studies when the reported data permitted their calculation. Effect sizes for the group designs were calculated using Cohen's (1992) *d*. A Cohen's *d* of .20 is considered a small effect, .50 a medium effect, and .80 a large effect. For the single-subject design studies, effect sizes were calculated using Tau-*U* (Parker, Vannest, Davis, & Sauber, 2011). Tau-*U* calculates the percentage of non-overlap between the phases and the percentage of data showing improvement between the phases. The benefit of using Tau-*U* over other traditional non-overlap effect size methods (e.g., percentage of non-overlap data) is that Tau-*U* accounts for trend in the baseline. Tau-*U* is also flexible, allowing for a calculation of effects for each baseline-intervention pair and for a calculation of the average of all Tau-*U* scores. Tau-*U* yields scores ranging from 0% to 100% (Rakap, 2015). A score of 65% or less is considered ineffective or questionable, a score between 66% and 92% is considered effective, and a score equal to or greater than 93% is considered very effective. The Tau-*U* effect sizes were computed using a software application developed by Vannest and colleagues (Vannest, Parker, Gonen, & Adiguzel, 2016).

Results

Distribution of Studies

When looking at interventions by type of instruction, eight were *Curriculum-Based*, six combined *Phonological Awareness + Alphabet Instruction*, and three were *Phonological Awareness-Only*. Nine of 17 were delivered only in English, six in both languages, and two in Spanish. Of the English studies, four combined *Phonological Awareness + Alphabet Instruction* (three group and one single-subject design), two were *Phonological Awareness-Only*, and three were *Curriculum-Based*. Studies conducted in both languages included one that combined *Phonological Awareness + Alphabet Instruction*, one that was *Phonological Awareness Only*, and four *Curriculum-Based* interventions. Spanish language interventions consisted of one combined *Phonological Awareness + Alphabet Instruction* and one *Curriculum-Based* study.

Four studies focused on children in preschool, five targeted children in kindergarten, seven studies included children in first grade, and one study focused on second grade. Most interventions were delivered in small groups by teachers or paraprofessionals (Table 5). Interventions ranged from 6 weeks to a full-school year. The dosage of the interventions ranged from 15 to 50 min per session.

The phonological awareness skills targeted during instruction varied across studies. Common phonological awareness targets included rhyming, blending, syllable awareness, and phoneme segmentation. Of the 17 studies, six measured phonological awareness gains in both English and Spanish (Barnett, Yarosz, Thomas, Jung, & Blanco, 2007; Farver, Lonigan, & Eppe, 2009; Gerber et al., 2004; Vaughn, Cirino, et al., 2006; Vaughn, Linan-Thompson, et al., 2006; Vaughn, Mathes,

Table 5. Description of Studies Systematic Reviews.

Authors	Grade	Classroom context	PA skill(s) targeted	Format/setting	Sample size	Intervention	Instructional approach	Interventionist	Dosage	PA outcomes	Results
English											
PA + Alphabet instruction											
Roberts and Neal (2004)	preschool	Not specified	Rhyming	Small group	11	Group A: Letter knowledge and rhyming. Group B: Comprehension	Rhyming taught by asking children to identify which word rhymed with the target word out of a field of two. In total, 10 CVC words presented in each session. Letters taught by asking children to name letters. One letter was presented per session.	Undergraduate assistants and classroom teachers.	20 to 25 min sessions; 3x/week/ 16-week total	Research-developed assessment of rhyming (identification task)	Neither group made gains in PA
Solari and Gerber (2008)	kinder	Not specified	Onset, rime, blending, and segmentation	Small group	82	Intensive PA intervention with alphabet knowledge vs. combined PA + Listening Comprehension vs. brief PA intervention control group	Targeted PA and alphabet instruction	Graduate students	20 min sessions; 3x/week	(a) Rime detection; (b) onset detection; (c) segmentation; (d) CTOPP; (e) Story Recall, Word ID, and Word Attack subtests from WJTA-III; (f) PPVT	Group receiving Listening Comprehension + brief PA instruction outperformed the PA intensive group and control group on almost every measure.
Calhoon, Al Otaiba, Greenberg, King, and Avalos (2006)	first grade	Two-way bilingual immersion	Segmentation	Whole group and small groups	78	Peer-Assisted Learning Strategies (PALS)	Dyad of high performing students mentor lower performing students. PA and alphabet skills taught by: (a) saying the letter names and sounds; (b) segmenting CVC words; (c) decoding CVC words; (d) reading simple stories with the targeted decodable words and sight words.	Teachers and peers	30-35 min sessions; 3x/ week; 20 weeks total	PSF, NWF, and ORF subtests from DIBELS	DLL children in in the PALS condition demonstrated larger gains on the PSF and NWF. The control group did better on the ORF measure.
Gyovai, Cartledge, Kourea, Yurick, and Gibson (2009)	kinder-first grade	English-immersion classroom	Initial sound identification	Small groups; small room adjacent to classroom	12	*Early Reading Intervention* (Connected sounds of words and spelling)	Used model-lead-test approach: (a) introduce letter and sound; (b) isolate initial sound; (c) reintroduce target sound; (d) practice phonological and spelling skills	Graduate students	20 min sessions; 2 to 4x/week; 7 to 15 weeks total	(a) PSF from the DIBELS; (b) Letter Word Id. and Word Attack WJTA-III; (c) Curriculum-based measures of PA skills	In total, five out of the 12 students improved status to benchmark, two remained in benchmark, and one regressed from strategic to intensive. Positive effect on phoneme segmentation skills.
PA only											
Healy, Vanderwood, and Edelston (2005)	first grade	Not specified	Not specified	Small groups	15	*Sounds and Letters for Readers and Spellers*	Not specified	Graduate students	30 min sessions; 2x/week; ~16 weeks total	PSF subtest from DIBELS	Children improved PA skills as indicated with large effects.
Leafstedt, Richards, and Gerber (2004)	kinder	Not specified	Early PA skills (rime and onset identification) and late PA skills (segmenting of sounds)	Small groups. Children grouped into high, medium, and low performing groups.	46	Early Reading Project	Used Core Intervention model that applied a corrective staircase, contingent feedback, reteaching.	Special education teachers	15 min sessions; 2x/week; 10 weeks total; 300 min total	Research-developed measures of PA (onset-rime identification, phoneme segmentation; Word Attack subtest from WJT-III; NSF and PSF from DIBELS; PPVT	The high and medium groups outperformed the control group but there were no differences between the low performing group and the control group.

(continued)

Table 5. (continued)

Authors	Grade	Classroom context	PA skill(s) targeted	Format/setting	Sample size	Intervention	Instructional approach	Interventionist	Dosage	PA outcomes	Results
Curriculum based											
Han, Vukelich, Buell, and Meacham (2014)	Preschool-second grade	Not specified	Not specified	Small group	102	*Creative Curriculum*	Not specified	Teachers	One 10 min PA and alphabet knowledge session per day. Low performing children received 30 min of tutoring twice per week.	Rhyming and Alliteration subtests from the IGDIs	Children who were DLL made gains over time in their rhyming and alliteration skills. By second grade, there was not a difference in performance between monolingual and DLL children.
Vaughn, Cirino, et al. (2006)	first grade	Not specified	Phoneme discrimination and phoneme blending and segmenting	Small groups of three to five children	48	Beginning English reading curriculum modified for DLLs by including language-support activities	Direct instruction including phonemic awareness instruction. Children required to isolate initial, medial, and final sounds. Also included blending and segmenting. Teacher-modeled tasks and provided feedback.	Bilingual research assistants	50 min per day; 5 days/week; 7 months total	(a) English/Spanish assessments; (b) Letter Naming; (c) CTOPP; (d) TOPPS-S; (e) DIBELS; (f) IDEL	Children in the treatment group did better than the control in their English and Spanish PA skills than the control group. No improvement on the DIBELS/IDEL measures, however.
Linan-Thompson, Vaughn, Hickman-Davis, and Kouzekani (2003)	second grade	Early-transition program	Phoneme segmentation, blending, deletion, manipulation	Individual/small groups	26	Latters to Literacy and Phonemic Awareness in Young Children: A Classsroom Curriuculum	Instruction modified for DLLs by providing pictures and completing auditory discrimination tasks. Intervention involved phonological awareness, level reading, word study, and writing.	Teachers	30 minute sessions; 5x/week; 13 weeks total	(a) Word Attack and Passage Comprehension subtests from W-MLS; (b) PSF from DIBELS; (c) Test of Reading Fluency	Children only made gains on phoneme segmentation fluency and passage comprehension.
Both languages											
PA + Alphabet instruction											
Quiroga, Lemos-Britton, Mostafapour, Abbott, and Berninger (2002)	first grade	English-immersion classroom	Syllable and phoneme segmentation	Individual sessions	8	(a) Spanish and English PA training program (syllable segmentation, phoneme segmentation); (b) Alphabetic training in spelling-phoneme correspondence using *Talking Letters Program*	Spanish: Played "Sounds Games" (a) Detecting a target sound out of field of words; (b) detecting if a sound was missing in the medial position; (c) omitting sounds in words; (d) sound substitutions in words. English: Counted number of syllables and phonemes in words using counters.	Bilingual psychologists	30 min sessions; 2x/week; 6 weeks total	Word Identification and Word Attack subtests from WJTA-III	Children who were DLL who received the intervention raised their English reading scores by a standard deviation of 0.8 for real words, and by 0.5 standard deviations on non-words.
PA only											
Gerber et al. (2004)	kinder-first grade	Not specified	Onset-rime detection in kindergarten, and phoneme segmentation, and blending first grade	Not specified	142	*Core Intervention Model*	Used Cored Intervention model that applied a correction staircase, contingent feedback, and reteaching.	Undergraduate bilingual tutor	30 min sessions; 10 sessions total	(a) Spanish/English research-developed measures of early developing PA onset/rime and (b) Late developing PA; segmentation	Children in intervention improved Spanish PA skills and English segmenting skills, but did not make gains on English onset/rime identification.

(continued)

Table 5. (continued)

Authors	Grade	Classroom context	PA skill(s) targeted	Format/setting	Sample size	Intervention	Instructional approach	Interventionist	Dosage	PA outcomes	Results
Curriculum based											
Barnett, Yarosz, Thomas, Jung, and Blanco (2007)	preschool	Some students in English-immersion, other in Two-Way bilingual classrooms	Rhyming, phoneme deletion	Whole group; classroom	150	High Scope Curriculum	Not specific	Classroom teachers	School year (no further details provided)	Spanish/English research-developed measure of PA including: phoneme deletion, rhyme recognition, and alphabet recognition	Children receiving bilingual instruction made gains in both languages than children in English-immersion classroom.
Farver, Lonigan, and Eppe (2009)	preschool	Some children in English-immersion classrooms, others in transitional bilingual classrooms	Word and syllable blending, elision	Small groups; small room to adjacent classroom	96	Group A: English-only *High Scope with Literacy Express*; Group B: transitional instruction through parallel Spanish-English *High Scope* + *Literacy Express*; Group C: English, *High Scope only* (control)	Utilized word games that used picture-puzzles and other manipulatives to manipulate words. Word manipulations were developmentally sequenced.	Bilingual graduate assistants	20 min lessons; 4x/week; 21 weeks total	Spanish/English Pre-CTOPP	Children in the English and transitional treatment groups did better than control group. Only children receiving bilingual instruction made gains on Spanish PA.
Calhoon, Al Otaiba, Cihak, King, and Avalos (2007)	first grade	Two-way bilingual immersion program	Segmentation	Small groups	76	Peer-Assisted Learning Strategies	PA and alphabet skills taught by: (a) saying the letter names and sounds; (b) segmenting CVC words; (c) decoding CVC words; (d) reading simple stories with the targeted decodable words and sight words. Also worked on story sharing skills, including making predictions about stories.	Classroom teachers	30-35 min sessions; 3x/week; 20 weeks total	LNF, PSF, NWF, and subtests from DIBELS	DLL children in PALS condition outperformed children in control condition on the PSF, NWF, and LNF tasks.
Vaughn, Linan-Thompson et al. (2006)	first grade	Spanish study: conducted in Transitional Bilingual Classrooms. English study: conducted in English-immersion classrooms	Phoneme identification and phoneme segmentation and blending	Small group of three to five students	Spanish study: 94; English study: 96	English study: *Proactive Reading*, adapted for children who were DLL by using visuals, gestures, and clarifications. Spanish study: *Lectura Proactiva*	Direct Instruction. Children taught to segment words into phonemes and blend phonemes back into words.	Hired bilingual researchers	50 min sessions; 5x/week; ~8 months total	(a) Letter Naming; (b) CTOPP; (c) TOPP-S; (d) DIBELS; (e) IDEL	Spanish study: children in intervention group made large gains on their Spanish PA skills. English study: children in the intervention made moderate gains on their Spanish PA skills.

(continued)

Table 5. (continued)

Authors	Grade	Classroom context	PA skill(s) targeted	Format/setting	Sample size	Intervention	Instructional approach	Interventionist	Dosage	PA outcomes	Results
Spanish											
PA + Alphabet instruction											
Linan-Thompson, Bryant, Dickson, and Kouzekanani (2005)	kinder	Not specified	Segmenting and blending of phonemes	Small groups	128	Systematic explicit Spanish reading instruction	Direct instruction. Modeling/leadgroup responses, where children blended and segmented phonemes using manipulatives that were gradually faded.	Classroom teachers	20 min sessions; 3x/week; ~12 sessions total	*Tejas Lee*	Children in the experimental group caught up to their typically developing peers on syllable blending and syllable identification; however, they continued lagging behind their peers on phoneme blending and phoneme deletion.
Curriculum based											
Vaughn, Mathes, et al. (2006)	first grade	Transitional bilingual classrooms	Segmenting and blending at the phoneme level	Small groups of three to five children	69	*Letura Proactiva*	Direct instruction. Instruction included modeling, increased practice opportunities, guided and independent practice.	Bilingual certified teachers	50 min sessions; 5x/week; ~7 months total	(a) CTOPP; (b) TOPP-S	Children in the intervention group made large gains on their Spanish PA skills, but there was no difference in children's English PA skills between the treatment and control groups.

Note. PA = phonological awareness; CVC = consonant-vowel-consonant; PSF = Phoneme Segmentation Fluency; ORF=oral reading fluency; LNF=Letter Naming Fluency; NWF=Nonword Fluency; DIBELS = Dynamic Indicators of Basic Early Literacy Skills; WJTA = Woodcock-Johnson Test of achievement; IGDIs = Individual Growth and Developmental Indicators; DLL = dual language learners; CTOPP = Comprehensive Test of Phonological Processing; TOPP-S = Test of Phonological Processing-Spanish; IDEL = Indicadores Dinámicos del Éxito en La Lectura; Pre-CTOPP = Preschool Comprehensive Test of Phonological Processing; W-MLS=Woodcock-Muñoz Language Survey.

et al., 2006). All but one of these six studies (Vaughn, Mathes, et al., 2006) delivered phonological awareness instruction in Spanish and English.

Judging the Overall Quality of Studies by Rating

Visual displays resembling *Consumer Reports* are presented in Tables 2 and 3. Studies can be evaluated by examining the number of white (*exemplary* = 4) or partially white (*acceptable* = 3) circles in comparison with the circles that are partially black (*minimal* = 2) or black (*unacceptable* = 1) for each quality indicator. An average rating of all the quality indicators can be found in the first column for each study. For example, Table 3 illustrates that Roberts and Neal's (2004) study investigating the effects of an English intervention targeting phonological awareness and alphabet knowledge received an average rating of 2.53 (maximum = 4).

In total, 58% of the studies (10 of 17) earned an average rating of 2.5 or higher, meaning their ratings overall were in the *minimal* to *acceptable* range. The average ratings ranged from an average rating of 1.86 (Healy, Vanderwood, & Edelston, 2005) to 3.07 (Farver et al., 2009). The average rating by types of intervention was slightly higher for *Curriculum-based* (M = 2.79), followed by *Phonological Awareness + Alphabet Knowledge* (M = 2.39) and *Phonological Awareness-only* (M = 2.20). The average rating by language of instruction was highest for the Spanish interventions (M = 2.57), followed by the English language interventions (M = 2.44) and the bilingual interventions (M = 2.39). These averages should be interpreted with caution as there were many more English-only studies than bilingual or Spanish-only studies. Most studies failed to report measures of generalization and maintenance, or social validity. Only two studies (Calhoon, Al Otaiba, Cihak, King, & Avalos, 2007; Calhoon, Al Otaiba, Greenberg, King, & Avalos, 2006) reported the extent of consumer satisfaction.

Studies receiving the lowest ratings (Healy et al., 2005; Linan-Thompson, Bryant, Dickson, & Kouzekanani, 2005; Quiroga, Lemos-Britton, Mostafapour, Abbott, & Berninger, 2002) typically had minimal or unacceptable ratings not only on their measures of external validity, but on their design characteristics as well. For example, the Linan-Thompson et al. (2005) group design study lacked randomization, did not demonstrate group equivalence, provided only operational definitions of its measures, and did not report how reliability was calculated. Limitations in its design characteristics reduced the internal validity of the study and diminished confidence in the study results. Similarly, the single-subject design study by Healy and colleagues (2005) earned a low-average rating because it did not establish a steady baseline, used an AB design, and did not describe its visual analysis. Although the children in this study made gains in their intervention, the limitations in the study's design affected researchers' ability to interpret findings with confidence.

Effect Size Estimates

Tables 3 and 4 contain a column with effect size estimates for group design and single-subject designs, respectively. For the group design studies, Cohen's d was calculated for 13 of the 15 group design studies. The effect sizes could not be calculated for one study due to limitations in the data provided (Quiroga et al., 2002). Although Cohen's d could not be calculated for the Barnett et al. (2007) study, the authors provided an R^2 value corresponding to a medium effect size in Spanish and English. An effect size could be calculated for only one of the two single-subject design studies (Gyovai, Cartledge, Kourea, Yurick, & Gibson, 2009), whose results yielded a Tau-U effect size of 52%, indicating questionable effects.

Types of Intervention

Looking across types of interventions, studies investigating the effects of *Curriculum-Based* approaches resulted in effect sizes ranging from small to large (Table 5). One study resulted in

small effects (Calhoon et al., 2007), two studies had moderate effects (Barnett et al., 2007; Han, Vukelich, Buell, & Meacham, 2014), one had large effects (Vaughn, Mathes, et al., 2006), and four yielded mixed effects (Farver et al., 2009; Linan-Thompson et al., 2005; Vaughn, Cirino, et al., 2006; Vaughn, Linan-Thompson, et al., 2006). Studies that explicitly taught the phonological awareness skills assessed as outcome measures led to the highest effect sizes (Vaughn, Mathes, et al., 2006). The Barnett et al. (2007) and Han et al. (2014) studies yielded moderate effect sizes when using commercially available curricula such as *High Scope* and *Creative Curriculum*. It should be noted, however, that although children who were DLL in the Han et al. (2014) study made gains, they remained below their monolingual peers by the end of second grade. These researchers targeted rhyming in kindergarten, and phoneme segmentation in first grade.

Studies evaluating the effects of *Phonological Awareness + Alphabet Knowledge* instruction yielded mixed results. Two studies resulted in a small effect sizes (Gyovai et al., 2009; Roberts & Neal, 2004), one study yielded moderate effects (Linan-Thompson et al., 2005), one study resulted in large effects (Calhoon et al., 2006), one study had mixed effects across different phonological awareness outcomes (Solari & Gerber, 2008), and the effect sizes of one of the studies (Quiroga et al., 2002) could not be calculated. The Calhoon et al. (2006) study investigated the effects of providing first grade Latino students who are DLL with peer-assisted instruction targeting letter sounds, segmentation, and decoding. Children receiving this intervention made gains on the DIBELS Phoneme Segmentation and Nonword Fluency subtests. The Solari and Gerber (2008) study, which targeted phonemic segmenting and blending and phonics training, produced a large effect for initial sound identification, but small effects for sound omission and blending. The Roberts and Neal (2004) study had the weakest effects. This intervention targeted preschoolers and taught letter knowledge, letter writing, and rhyming. Although the children in this study made gains in letter knowledge, their rhyming skills did not improve significantly.

Because only three studies investigated the effects of *Phonological Awareness-only* instruction, determining the effects of this approach is premature. Two studies had mixed effects across phonological awareness tasks (Gerber et al., 2004; Leafstedt, Richards, & Gerber, 2004), and the effects of one study could not be calculated (Healy et al., 2005). The Leafstedt et al. (2004) study investigated the effects of an intervention targeting onset-rime identification and segmentation on kindergartener's phonological awareness skills. The effects for this study were large for onset-rime identification, but moderate for segmentation, a phonological awareness skill the authors described as *later developing*.

Language of Instruction

We also evaluated the effects of studies by language of instruction. For the studies that only delivered instruction in English (see Tables 3 and 4), two studies had small effects (Gyovai et al., 2009; Roberts & Neal, 2004), two had moderate effects (Han et al., 2014; Linan-Thompson, Vaughn, Hickman-Davis, & Kouzekanani, 2003), three had large effects (Calhoon et al., 2006; Vaughn, Mathes, et al., 2006), two had mixed results (Leafstedt et al., 2004; Solari & Gerber, 2008), and the effects of one study could not be calculated (Healy et al., 2005). Only Vaughn, Mathes, et al. (2006) measured the Spanish phonological awareness gains of Latino DLLs when providing English-only instruction. First grade Latino children receiving English-only instruction targeting phoneme discrimination, segmenting, and blending made large gains in English, and in Spanish on the CTOPP.

The bilingual interventions yielded mixed effect sizes (see Table 3). One study resulted in small effects (Calhoon et al., 2007), one yielded moderate effects (Barnett et al., 2007), three led to mixed effects (i.e., effect sizes were not equal across languages; Gerber et al., 2005; Farver et al., 2009; Vaughn, Cirino, et al., 2006), and the effect size of one of the studies could not be calculated (Quiroga et al., 2002). Farver et al. (2009) and Vaughn, Cirino, et al. (2006) found that

children receiving phonological awareness instruction in both languages made gains in Spanish, while still acquiring phonological awareness skills in English. In both studies, children receiving bilingual instruction made greater gains in Spanish than their peers who received English-only instruction. However, children's phonological awareness gains across their two languages were not equivalent. For example, in the Farver et al. (2009) study, preschoolers showed moderate gains in Spanish and mixed gains in English.

The effects of the two studies investigating phonological awareness instruction in Spanish were also mixed (Linan-Thompson et al., 2005; Vaughn, Linan-Thompson, et al., 2006) (Table 2). The Linan-Thompson et al. (2005) study targeting Spanish phonological awareness skills (segmenting, blending) and phonics led to moderate gains in Spanish initial sound identification, but the gains on blending and sound omission were small. In contrast, the Vaughn, Linan-Thompson et al. (2006) intervention, *Lectura Proactiva*, targeting alphabet knowledge, text comprehension, and oral language skills led to large phonological awareness gains in Spanish, and moderate gains in English. These promising results highlight the need for further investigation of the effects of delivering phonological awareness instruction in Spanish to children who are DLL.

Discussion

As the number of Latino children who are DLL and are served by schools across the United States continues to rise (U.S. Census Bureau, 2011), it becomes even more crucial to carefully examine and evaluate the interventions designed to improve the educational outcomes of this population. Many Latinos who are DLL struggle to become proficient readers (Fuller, 2011), making it particularly timely to evaluate the current body of literature targeting reading instruction for this group of children. The findings from this systematic review not only provide an overview of the distribution, quality, and effects of existing phonological awareness intervention for these children, but they also provide important, general implications for conducting adequate interventions and research for Latino children who are DLL.

Distribution, Quality, and Effects of PA Interventions for Latino Children Who Are DLL

Distribution of studies. The first aim of this systematic review was to determine the distribution of existing phonological awareness interventions for Latino children who are DLL. The findings from the systematic review indicate that most phonological awareness interventions were *Curriculum-Based*, that very few interventions targeted preschoolers, and that most interventions were conducted only in English. These findings are surprising, given our contemporary understanding of effective phonological awareness interventions (Ehri et al., 2001; Shanahan & Lonigan, 2010) and our knowledge regarding the best practices for delivering interventions to children who are DLL (Castro et al., 2011; López & Greenfield, 2004).

This review reveals that only four studies have specifically examined the effects of providing phonological awareness interventions to Latino preschoolers who are DLL (Barnett et al., 2007; Farver et al., 2009; Han et al., 2014; Roberts & Neal, 2004). This is a notable finding because phonological awareness is a common metric of preschoolers' school readiness (La Paro & Pianta, 2000) and a popular learning objective on widely used early childhood curricula such as *Creative Curriculum* and *High Scope*. Almost half of Latino preschoolers enter kindergarten with reduced phonological awareness skills in English and Spanish, placing them at greater risk for persisting reading difficulties (Fuller, 2011). But as the current literature stands, the bulk of phonological awareness interventions for preschoolers are based on monolingual children (Ehri et al., 2001), leaving practitioners ill-equipped to provide early, preventive phonological awareness interventions for Latino preschoolers during a crucial period of their development. The findings from this

review indicate the urgency for future research focusing on the effects of phonological awareness interventions for Latino preschoolers who are DLL.

Another significant finding is that most phonological awareness interventions for Latino children who are DLLs were only conducted in English. Although this review revealed that Latino children can make positive phonological awareness gains when interventions are delivered only in English, Pollard-Durodola and Simmons (2009) propose that the goal of interventions for Latino DLL should not only be to attain English academic success, but also to promote their biliterate and bilingual development. Because phonological awareness skills are highly interrelated across children's two languages, López and Greenfield (2004) and Anthony and colleagues (2011) recommend promoting Latino children's bilingual acquisition of phonological awareness skills by delivering the interventions in Spanish, or by supporting English phonological awareness instruction with Spanish. These recommendations are aligned with the Revised Linguistic Interdependence Hypothesis (Verhoeven, 2007), which postulates that DLL children with strong phonological awareness skills in one language can apply these skills to their second language. Despite these recommendations, only two studies in this review delivered the phonological awareness interventions in *Spanish* (Linan-Thompson et al., 2005; Vaughn, Linan-Thompson, et al., 2006), and only Vaughn and colleagues measured whether children applied the phonological awareness skills they learned in Spanish to English after receiving Spanish-only intervention. These findings indicate a need for future DLL research to empirically measure whether providing Latino children with only Spanish phonological awareness interventions yields phonological awareness gains in their two languages. Findings from these studies will potentially increase our knowledge regarding DLL children's bilingual literacy development.

Quality of studies. The second objective of this review was to determine the quality of existing phonological awareness interventions for children who are DLL. Most studies demonstrated strengths in their design and statistical analyses. However, few included measures of generalization (Gerber et al., 2004; Han et al., 2014) and social validity (Calhoon et al., 2007; Calhoon et al., 2006). Including measures of generalizations is important because the long-term effects of providing children who are DLL with instruction in English, Spanish, or both languages remains largely unexplored. Although some scholars assert the academic and social benefits of supporting DLL children's language and literacy development in both languages (Bialystok & Feng, 2011), few studies have examined the long-term impact of language of instruction. Longitudinal studies are needed to increase our knowledge of typical dual language and literacy development in children who are DLL, as well as to inform policy makers about ways to reduce the persisting achievement gap in this population.

Effects of studies. The third objective of this review was to evaluate the effects of phonological awareness interventions for Latino children who are DLL. Overall, the effects of these studies were positive, yielding small to large effects. However, limitations in these studies make it difficult to directly compare which type of intervention and language of instruction is most effective for Latino children who are DLL. These limitations include the following: (a) brief descriptions of the interventionists and participants in the studies, (b) insufficient information about how to specifically deliver phonological awareness interventions, (c) minimal information about how phonological awareness interventions were adapted from English to Spanish, (d) heterogeneity in the phonological awareness assessments used to measure outcome measures, and (e) inadequate descriptions of the type and quality of the language of instruction occurring in the classroom (e.g., two-way bilingual, English immersion, transitional).

Despite these limitations, individual examination of the studies' effects indicate that phonological awareness interventions containing direct instruction (Calhoon et al., 2006; Vaughn, Mathes, et al., 2006) resulted in the largest phonological awareness gains, regardless of type of

intervention (i.e., *Curriculum-Based, Phonological Awareness + Alphabet Knowledge, Phonological Awareness-only*) or language of instruction. These finding are in line with the best practice recommendations from the National Early Literacy Panel (Lonigan & Shanahan, 2009), which recommends providing explicit phonological awareness instruction. Like monolingual children, Latino children who are DLL benefit from interventions that incorporate explicit instruction of phonological awareness skills, guided practice, contingent feedback, and multiple response opportunities. The studies with large effects also applied intensive phonological awareness instruction, ranging from 2 to 5 times a week for a minimum of 15 min per session, and interventionists delivered instruction in small groups. These findings were contrary to the study resulting in the smallest effects (Roberts & Neal, 2004). Roberts and Neal targeted letter knowledge and rhyming during whole-group instruction. Rhyming was taught by having children identify rhyming pairs with minimal feedback and practice opportunities provided. The weak results in this study could be attributed to rhyming not being as salient in Spanish (Pollard-Durodola & Simmons, 2009), a lack of explicit instruction, and reduced practice opportunities.

The most interesting finding from this systematic review is that most bilingual phonological awareness interventions yielded mixed effects, meaning that the magnitude of phonological awareness gains were not equivalent across languages. These findings have significant implications for DLL research. Gottardo, Gu, Mueller, Baciu, and Pauchulo (2011) note that a potential reason for these mixed findings for DLL children's gains across their two languages could result from studies' conceptual limitations. These conceptual limitations include unavailable descriptions of child, teacher, and classroom factors that might influence bilingual phonological awareness outcomes, and the use of direct English translations to develop Spanish interventions and assessments. Peña and colleagues (2016) warn against directly translating curricula or assessments, as this can reduce the validity of bilingual studies. To illustrate, Gerber et al. (2004) directly translated its English curriculum and targeted sound segmentation and blending in Spanish. Sound-level manipulations are not as salient in Spanish (Jiménez González & García, 1995). This difference between English and Spanish could have potentially tampered the results. Although addressing these conceptual limitations is vital in moving the field of DLL research forward, it is not an easy feat. There continues to be a gap in our knowledge regarding English and Spanish phonological awareness development in Latino children who are DLL and in the availability of appropriate assessments for this population.

Implications for Future Research

The findings from this systematic review augment our current knowledge regarding the quality and effects of existing phonological awareness interventions for Latinos who are DLL in the early and primary grades. This review has limitations, however, including the following: (a) the studies reviewed were from a relatively narrow time window, (b) the diversity in outcome measures make it difficult to directly compare studies, and (c) the questions of for whom and under what conditions these phonological awareness interventions are most appropriate remain unanswered. Limitations in the body of literature reviewed include the following: (a) the potential influence of teacher, child, and classroom-level factors were not reported, (b) the nuances of language of instruction across studies could not be fully explored, and (c) most of the Spanish phonological awareness interventions and assessments reviewed were direct English translations.

Despite these limitations, this systematic review illuminates current gaps in the literature, informing future research directions. These future directions include the following: (a) increasing the number of studies focusing on evaluating the effects of phonological awareness interventions for Latino preschoolers, (b) evaluating the effects of providing phonological awareness interventions in Spanish, (c) developing more valid Spanish phonological awareness assessments and interventions that take the language characteristics of Spanish in consideration, (d) exploring the

interrelationship of DLL children's phonological awareness skills across their two languages, and (e) conducting more longitudinal studies to better understand the bilingual and biliterate development of children who are DLL. Most notably, it is critical to continue identifying efficacious literacy-based interventions that are mindful of DLLs' unique language, social, and academic needs.

Implications for Practice

Although the extant body of literature on effective phonological awareness interventions for Latino children who are DLL in the early and primary grades is limited, the results of this systematic review can be applied to provide practitioners with guidelines to help improve the phonological awareness skills of children who are DLL. Specifically, practitioners should

1. Provide children with phonological awareness interventions that contain direct instruction which is explicit and systematic, allowing for multiple response opportunities and contingent feedback.
2. Deliver intensive phonological awareness interventions in small groups for children who might be falling behind their peers.
3. Include phonological awareness instruction in early childhood settings to ensure children are not falling behind upon entering kindergarten.
4. Learn about the language differences between English and Spanish to avoid direct translations of phonological awareness curricula or assessments.
5. Support children's acquisition of phonological awareness skills in both languages to promote their biliterate development.
6. Target phonological awareness skills that are salient in Spanish (i.e., syllable awareness rather than phonemic awareness) when the phonological awareness intervention is in Spanish.

Authors' Note

The adaptation of the Consumer Reports graphical model in this article does not indicate any endorsement by or affiliation with Consumer Reports®. Consumers Union was not involved in any way in the creation, production, or application of the evaluation framework or ratings described in the article.

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Quantity and Quality of Parental Utterances and Responses to Children With Hearing Loss Prior to Cochlear Implant

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Abstract

This study investigated the extent to which parental language input to children with hearing loss (HL) prior to cochlear implant (CI) differs from input to children with typical hearing (TH). A 20-min parent–child interaction sample was collected for 13 parent–child dyads in the HL group and 17 dyads in the TH group during free play. Ten minutes were transcribed and were coded for four variables: (a) overall utterances, (b) high-quality utterances, (c) utterances in response to child communicative acts (i.e., overall responses), and (d) high-quality utterances in response to child communicative acts (i.e., high-quality responses). Differences were detected for both quantity and quality of parental language input across the two groups. Early language skills correlated with three out of the four parental variables in both groups. Post hoc analyses suggested that the lower rate of high-quality responses in parents of children with HL could be attributed to lower intelligibility of child communication.

Keywords

hearing loss, language, communication, parent–child interactions

Introduction

The primary goal of this study was to examine the extent to which parental language input to children with hearing loss (HL) prior to cochlear implant (CI) differs from input to children with typical hearing (TH) and to explore the relationship between parental language input and early language development. From a social interactionist perspective of language development (Sameroff, 1975, 2009), children learn language through *bidirectional* and *transactional* language exchanges with caregivers. Parental language input supports language learning by providing the child with developmentally appropriate language models, which in turn results in greater child language skills that subsequently elicit more complex language input from the parent (Sameroff, 2009). Considering the bidirectionality of parent–child interactions, the communicative behaviors of the child also influence parent behaviors. In children with HL, auditory and communicative characteristics such as reduced audibility (McCreery et al., 2015), low rate of

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communication (Vohr et al., 2008), difficulty establishing joint attention (Prezbindowski, Adamson, & Lederberg, 1998), and atypical babbling patterns (Levitt, McGarr, & Geffner, 1987; Von Hapsburg & Davis, 2006) may make it challenging for parents to establish or maintain an interaction.

The implementation of early identification and advances in hearing technology, particularly the CI, has been vital in providing early auditory access and facilitating spoken language learning for children with HL (Nicholas & Geers, 2007; Yoshinaga-Itano, 2004). However, the time lag between identification of HL and the age at which a child receives a CI is often at least 6 months but frequently much longer (Cole & Flexer, 2011; Kelly, 2013). This lag, during which children do not have sufficient access to auditory input, often occurs during the period of prelinguistic communication development (Sharma, Dorman, & Spahr, 2002). Past studies have consistently found that not all children with CIs develop age-appropriate spoken language skills compared to their peers with TH (Geers, Tobey, Moog, & Brenner, 2008; Holt, Beer, Kronenberger, Pisoni, & Lalonde, 2012; Nicholas & Geers, 2007). Thus, it is critical to study parent–child interactions during the prelinguistic period in children with HL who subsequently receive CIs for two primary reasons. First, the prelinguistic period can be an important time for optimizing long-term outcomes (Kaiser & Roberts, 2011), and parental language input is a malleable factor that can be adjusted to promote long-term language development (Roberts & Kaiser, 2011). Therefore, describing this population's prelinguistic learning environment is essential to understanding how early intervention may be tailored during this sensitive period. Second, understanding how parents use language with their children prior to a CI provides a baseline that allows for comparisons of parental language input preimplantation to postimplantation. This study extends the current literature by examining the quantity and quality dimensions of two types of parental language input (utterances and responses) to children with HL prior to implantation.

Unique Challenges Faced by Children Who Are CI Candidates

Despite recent advances in hearing technology, many children who receive CIs still face unique challenges in developing language skills commensurate with their peers with TH (Geers et al., 2008; Niparko et al., 2010). Children with CIs require a significantly longer time period to acquire their first 50 words (Nott, Cowan, Brown, & Wigglesworth, 2009), demonstrate lower expressive and receptive vocabulary knowledge at school entry (Lund, 2016), have difficulty with morphosyntactic development (Boons et al., 2013) and phonological awareness skills (Soleymani, Mahmoodabadi, & Nouri, 2016), and present with insufficient narrative skills (Boons et al., 2013; Crosson & Geers, 2000). Factors such as early auditory deprivation (Carlson et al., 2014), lengthy hearing aid trial periods (Morini, Golinkoff, Morlet, & Houston, 2017), insufficient hearing aid amplification (McCreery, Bentler, & Roush, 2013), and inconsistent hearing aid use (Moeller, Hoover, Peterson, & Stelmachowicz, 2009; Muñoz et al., 2015) continue to impact the amount of early linguistic exposure a child receives (Moeller & Tomblin, 2015).

Federal Drug Administration (FDA) CI candidacy guidelines stipulate a trial of hearing aid use including demonstration of limited-to-no benefit with appropriately fit aids and lack of progress in auditory skill development (Cohen, 2004; Nott et al., 2009). Due to these criteria, children with HL often experience early auditory deprivation for at least 12 months (i.e., the earliest age approved by FDA to receive CIs). The duration of the trial period usually varies depending on the degree of HL and can be a lengthy process (Morini et al., 2017). A study that examined common clinical practice related to CI candidacy revealed that the period is particularly long for children with moderate-to-severe and severe HL (Fitzpatrick et al., 2009). In these children, CIs usually only become an option when children are 18 months or older and not demonstrating any progress with hearing aids (Morini et al., 2017). A prolonged period between HL identification and CI

implantation is associated with poorer spoken language outcomes (Niparko et al., 2010). More recent studies have provided convergent evidence that reduced early language experience during the first year of life increases risk for persistent language delays (Levine, Strother-Garcia, Golinkoff, & Hirsh-Pasek, 2016; Moeller & Tomblin, 2015).

Remarkably, even though language development was rated as a major concern for parents of children with CIs during both preimplantation and postimplantation periods (Incesulu, Vural, & Erkam, 2003), parents are not typically provided with evidence-based strategies for communicating with their child and facilitating their child's language development during the preimplantation period (Kelly, 2013). There are abundant investigations on children's language development following CIs, but very little is known about early language development and parent–child interactions during the period prior to implantation. Given that a lag will likely always exist between HL identification and CI implantation, it is necessary to understand parent–child interactions during this critical period of language development. Understanding these interactions will support the delivery of effective early parent-implemented language interventions during this period.

The Impact of HL on Parent–Child Interactions

From a social interactionist perspective of language development (Sameroff, 1975, 2009), a child's language is shaped not only by parent and child characteristics but also by the interactions between the parent and child. Despite the original emphasis on bidirectional transactions between parents and children, the transactional model of development has been used more often to emphasize the unidirectional effect of environmental factors on development instead of the bidirectional interaction between dynamic systems (Sameroff & MacKenzie, 2003). However, it is important to note that instead of being passive recipients of environmental input, children are actively engaged in social interactions and elicit parent communication. The presence of HL may interrupt this transactional language exchange, thereby affecting parental input. For instance, reduced audibility may lead to children being less responsive to the input their parents provide, especially in difficult listening environments such as listening from distance or in background noise (Ambrose, Walker, Unflat-Berry, Oleson, & Moeller, 2015). Consequently, parents may restrict their utterances to ideal listening environments or simplify linguistic input to ensure their child can process the language input.

Evidence that characteristics of communication by children with HL can affect typical parent–child interactions can also be found in research focusing on vocal development and caregiver responsiveness. HL impacts children's prelinguistic vocalizations by at least 8 months of age (Kishon-Rabin, Taitelbaum-Swead, & Segal, 2009; Stoel-Gammon & Otomo, 1986). Many children with HL display both delayed onset of canonical babbling and restricted consonant inventories (Moeller et al., 2007; Von Hapsburg & Davis, 2006). Specifically, children with HL produce fewer alveolar consonants (Ambrose, Thomas, & Moeller, 2016), more glides and glottal stops (Vihman & Greenlee, 1987), less complex syllable shapes, and reduced range of consonant–vowel (CV) forms (Moeller et al., 2007). Mothers respond differently to various types of child vocalizations (Gros-Louis, West, Goldstein, & King, 2006). Consequently, atypical vocalizations by children with HL may elicit fewer acknowledgments and responses from the parent.

Two Types of Parental Language Input: Utterances and Responses

The focus of this study is parental language input to children with HL prior to CI implantation. Due to the limited amount of research conducted on parent–child interactions in children who are preimplantation, a review of the broader population of children with HL is presented in this section. Various studies have compared parental language input for children with HL and children with TH by analyzing parental utterances during parent–child interactions (Ambrose et al., 2015;

DesJardin et al., 2014; DesJardin & Eisenberg, 2007; Vandam, Ambrose, & Moeller, 2012). Studies focused on quantity have found inconsistent results about the amount of parental utterances. Vandam and colleagues (2012) used an automated technology to record and analyze natural linguistic environments of children with HL and did not find a significant difference in the number of words heard by children with TH and children with HL (Vandam et al., 2012). However, studies that coded parental utterances from parent–child interactions video samples have reported both higher (DesJardin et al., 2014) and lower totals of parental utterances across the two groups (Ambrose et al., 2015). Studies that focused on quality of parental utterances have explored the semantic content, syntactic complexity, use of facilitative language techniques, and diversity of input and have reported more convergent findings. Compared to parents of children with TH, parents of children with HL use (a) significantly less diversity of vocabulary (Ambrose et al., 2015); (b) fewer higher level facilitative language techniques, such as expansion, recast, and open-ended questions (DesJardin et al., 2014); (c) more directive interactions (Ambrose et al., 2015); and (d) less joint attention episodes (Depowski, Abaya, Oghalai, & Bortfeld, 2015; Gale & Schick, 2009). Given that most of these studies used age-matched peers with TH as the control group instead of language-matched peers, these qualitative differences could suggest that parents tailor their linguistic input to their child's language ability rather than to their chronological age.

Another type of parental language input that has received less attention in studies of children with HL is parental utterances *in response to* child communicative acts (referred to as *parental response* when discussing the behavior and *parental responsiveness* when discussing the construct throughout the rest of this article). *Parental response* is a subset of parental language input and a type of parent interaction style that emphasizes providing contingent responses to child communication (Bornstein & Tamis-LeMonda, 1989; Landry, Smith, Swank, Assel, & Vellet, 2001; Tamis-LeMonda, Bornstein, & Baumwell, 2001). The definition of parental response or responsiveness varies by study and can refer to emotional availability (Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999), parental sensitivity (Spencer & Meadow-Orlans, 1996, 2004), or contingent verbal responses (Landry, Smith, & Swank, 2006). In this study, it refers to *parental verbal responses that are temporally contingent to child communicative acts (i.e., a parent verbal communication that occurs within 3 s of a child communicative act).*

Parental responses are particularly important because they help children develop expectations about events following their own behavior and help them gain a sense of control over their environment (Baumwell, Tamis-LeMonda, & Bornstein, 1997). Consistent parental responses may also facilitate early language learning by teaching children that their communicative behavior could have an effect on their linguistic environment, thereby priming their attention to the linguistic information that follows their communication. Considering the importance of parental responses and the fact that many children with HL produce fewer intentional communicative acts than children with TH (Nicholas & Geers, 2007; Vohr et al., 2008), further investigation of parent responsiveness with children with HL is warranted. Although parent responsiveness has been widely researched in children with typical development and in children with language impairment (Bornstein & Tamis-LeMonda, 1989; Girolametto, Weitzman, Wiigs, & Pearce, 1999; Yoder & Warren, 1999), only one study has investigated parental verbal responses in children with HL. Smith and McMurray (2018) analyzed the temporal properties of maternal responses to children with and without HL and did not find a significant difference in latency or variability across the two groups. However, they did not analyze the content of parental responses.

The Present Study

The primary purpose of this study is to compare the quantity and quality of parental utterances and responses between children with TH and children with HL prior to cochlear implantation. We examined quantity of parental language input by analyzing the overall amount of parental

utterances and responses similar to Ambrose et al. (2015) and Vandam et al. (2012). However, this study differs from the aforementioned studies in that we used observational methods and sampled parental language input in a free-play context in the child's home. Quality of parental language input was examined by coding for semantic richness and the use of language facilitation strategies in parental utterances and responses. Past studies have shown that language facilitation strategies such as diverse and rich semantic content (Rowe, 2012), linguistic mapping (Yoder & Warren, 2001), semantic expansion (Scherer & Olswang, 1984), grammatical recasts (Cleave, Becker, Curran, Van Horne, & Fey, 2015), and follow-in comments (McDuffie & Yoder, 2010) support children's early language development. We also explored the relationship between these two types of parental language input and early language development in both populations. Previous work on parental language input has indicated that the relationship between parental input and child language development may be different in typically developing (TD) children compared to children with language impairments (Proctor-Williams, Fey, & Loeb, 2001).

The prelinguistic period is a critical time for maximizing long-term learning outcomes for children with HL (Moeller, 2000). Yet only two studies to date have investigated parental language input to young children with HL during this period (Ambrose et al., 2015; Smith & McMurray, 2018). Ambrose and colleagues examined parental talk during 5-min parent–child interactions and reported differences in the quality of parental language input between the HL group and TH group at 18 months and 3 years. Smith and McMurray (2018) focused on the latency and variability of maternal responses but did not address the quantity or quality of responses. This study expands upon previous literature by examining the quantity and quality aspects of parental utterances and responses to children with HL during the preimplantation and prelinguistic period of language development. Understanding differences in parental language input to children with HL prior to implantation is a critical step to determining the extent to which persistent language delays in children with CIs may be remediated via early parent-implemented language intervention. Specifically, three research questions guided this study:

Research Question 1: Do parents of children with HL provide fewer utterances and fewer high-quality utterances than parents of children with TH during parent–child interactions?
Research Question 2: Do parents of children with HL provide a lower rate of overall responses and a lower rate of high-quality responses than parents of children with TH during parent–child interactions?
Research Question 3: Is the relationship between the quantity and quality of parental language input and early language development conditional upon a child's hearing status (TH vs. HL)?

Method

Participants

Thirty children (13 in the HL group and 17 in the TH group) and their parents participated. Participants were recruited from the larger Chicago area in Illinois. Inclusion criteria for children with HL were as follows: (a) chronological age between 9 and 30 months at the time of recruitment, (b) bilateral sensorineural HL, (c) no CI at the time of this study, (d) from a home where English was the primary language spoken, and (e) no additional medical diagnoses. Only parents who had TH (pure-tone average 30 dB HL or less) were included in the study. Children in the TH group met the following criteria: (a) chronological age between 9 and 30 months at the time of recruitment, (b) from a home where English was the primary language spoken, and (c) no HL or other medical condition, based on parent report.

After the initial screening, eligible children and their parent were enrolled in the study. Baseline and demographic information for participants is provided in Table 1. Across both

Table 1. Baseline and Demographic Information for Parents and Children in the Study.

Characteristic	HL group (n = 13)	TH group (n = 17)
Age in months (M, SD)	14.7 (4.5)	17.4 (4.3)
Age range in months	10-27	11-29
Gender (n, %)		
Male	8 (61.5%)	9 (52.9%)
Female	5 (38.5%)	8 (47.1%)
Race (n, %)		
Caucasian	12 (85.8%)	13 (76.5%)
Other	1 (7.1%)	4 (23.5%)
Maternal education (n, %)		
Some college	4 (30.8%)	0 (0%)
College or higher	8 (61.5%)	17 (100%)
Not reported	1 (7.7%)	0 (0%)
Cognitive skills (M, SD)		
MSEL—Visual Reception Subscale	20.38 (11.98)	20.47 (3.86)
Better ear pure-tone average (dB HL; M, SD)	75 (26)	
Age at hearing loss identification (M, SD)	5.83 (7.22)	
Age at hearing aid fitting (M, SD)	8.08 (7.91)	
Language skills (M, SD)		
CSBS–DP total raw score	37.46 (20.77)	76.88 (27.79)
CSBS–DP Social Composite	26 (12.64)	33.59 (6.26)
CSBS–DP Speech Composite	5.62 (6.76)	18.24 (15.55)
CSBS–DP Symbolic Composite	5.85 (5.05)	25.06 (11.51)

Note. HL = hearing loss; TH = typical hearing; MSEL = Mullen Scales of Early Learning; CSBS-DP = Communication and Symbolic Behavior Scales–Developmental Profile.

groups, 25 out of 30 parent–child dyads were Caucasian; only one dyad identified as Hispanic. Audiological information for children in the HL group was acquired from their audiology records. All children in the HL group presented with bilateral sensorineural HL. The mean better-ear, pure-tone average (BEPTA) was 75 dB HL (SD: 26 dB). While all children in the HL group were CI candidates, none of them had received an implant at the time of the home visit and all were using bilateral hearing aids. None of the parent–child dyads used sign language. Maternal education was measured and used as a proxy for socioeconomic status (Ensminger & Fothergill, 2003; Hoff, 2006). Results from independent t tests and chi-square tests indicated that children in the two groups did not differ significantly on age, gender, race, or cognitive skills ($p > .05$ in all cases). However, a significant difference was detected in maternal education: mothers in the TH group had higher levels of education than mothers in the HL group ($p < .01$). This difference was accordingly tested and addressed in the following statistical analyses.

Measures

Early language development measure. Children's early language skills were assessed by trained research staff using the Communication and Symbolic Behavioral Scale–Developmental Profile (CSBS-DP; Wetherby & Prizant, 2002). The CSBS-DP is a standardized tool to evaluate communication and language abilities of children whose functional communication age is between 6 and 24 months. Three composite scores (Social, Speech, and Symbolic composites) combine to form a total score. Only spoken language was counted in the CSBS-DP scoring. Total raw score from the CSBS-DP served as our child-level-dependent variable for three reasons: (a) standard

or age equivalency scores were dependent on a sample normed with children with TH and thus would be uninterpretable for children with HL, (b) this instrument has only been normed in children between the ages of 12 and 24 months, and our sample included children up to 30 months, and (c) we were interested in children's individual communication competency instead of their relative standing within a population.

Cognitive skills measure. Raw scores from the Visual Reception Subscale of the Mullen Scales of Early Learning (Mullen, 1995) were used to assess participants' nonverbal cognitive skills. The Mullen is a norm-referenced developmental test for children from birth to 68 months. The Visual Reception Subscale tests children's visual processing, visual-spatial, and memory abilities and was used to control for nonverbal cognitive level across groups.

Procedure and Coding Definitions

Participants were drawn from a longitudinal randomized controlled trial (NCT01963468) that assessed the effects of a parent-implemented communication intervention in children who were CI candidates. In the longitudinal study, children with HL prior to implantation were randomly assigned to a parent-implemented communication intervention group or a business-as-usual control group. Only parents and children assigned to the business-as-usual group were included in the current study. As part of the larger study, home visits were conducted to collect data on parent–child interactions and children's early language skills. A 20-min parent–child play session was collected in each participant's home. The parents were instructed to play as they normally would until the timer beeped. To improve ecological validity, parents were instructed to use their own toys and materials in their home. Sessions were recorded by a hand-held digital video recorder and later transcribed using Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1985) conventions and coded by trained research staff.

The middle 10 min of each interaction sample were coded using a timed-event, frequency-based behavior sampling procedure (Yoder & Symons, 2010) with Mangold InterACT, a software that allows frame-by-frame coding of observational data from digital media (video and audio). The following child and parent variables were coded: *child communicative acts, temporal contingency of parental utterances* (i.e., within 3 s from a child communicative act), *topic contingency of parental utterances* (i.e., related to child's focus of attention or communication), and *semantic richness of parental utterances* (i.e., contained at least one meaningful content word).

Child and parental communicative acts. A child communicative act was defined as a production of (a) a real word that contains at least one consonant and one vowel and has a consistent referent, (b) a vocal communication that consists of a nonword vocalization, (c) a gesture that represents a specific action, item, or idea (e.g., head nod, thumbs-up, waving, proximal pointing), or a gesture that intrinsically shows coordinated attention to an object and an adult (e.g., giving, bidding to receive, showing), or (d) a conventional sign (e.g., American Sign Language). For adults, a communicative act was defined as a verbal utterance.

Temporal contingency of parental utterances. Temporal contingency measures how quickly a parent responds to a child's communicative act. After child communicative acts were identified, parental utterances that occurred within 3 s of the act were coded as temporally contingent. Based on previous mother–child interaction studies, a 3-s time window best captures temporal contingency (Van Egeren, Barratt, & Roach, 2001). Data from Smith and McMurray (2018) also suggest that most contingent responses occur within 3 s for both parents of children with TH and parents of children with HL.

Table 2. Definition and Examples of Parental Language Input Codes.

Code	Definition	Example
Temporal contingency	A parental utterance that responds to a child communicative act within 3 s.	Child: "Car" (1 s) Parent: "Yeah!" Child: "Car" (2 s) Parent: "Mm-hm." Child: "Car" (1 s) Parent: "Yes, I see a car!" (temporally and topically contingent)
Topic contingency	A parental utterance that relates to the child's focus of attention or communication.	Child: "Mommy?" Parent: "Yes, I'm here!" Child: "Train!" Parent: "What does your train do?" Child: "Sheep walking." Parent: "The sheep is walking."
Semantic richness	A parental utterance that includes at least one meaningful content vocabulary word (e.g., common or proper noun, content verb, adjectives, adverbs, and prepositions referring to locations)	Child: "Ball." Parent: "Roll the ball!" Child: {woof woof}. Parent: "I see a dog!" Counterexample: Child: {points to a dog}. Parent: {woof woof}. Parent: "Uh-huh." Parent: "There you go."

Topic contingency of parental utterances. Topic contingency captures how well a parent takes the child's lead and models language based on the child's focus of attention or communication. An utterance was coded as topic-contingent if it was related to what the child was communicating or doing. Examples of topic-contingent utterances include linguistic mapping, repetition, grammatical recasts, conversation repair strategies, and semantic expansions. In contrast, behavior management, redirects, or utterances that do not correspond to the presumed topic of the interactive context would not be coded as topically contingent.

Semantic richness of parental utterances. A parental utterance was coded as semantically rich if it included at least one meaningful content vocabulary (e.g., common or proper noun, content verb, adjectives, adverbs, and prepositions referring to locations). Counterexamples include nonlexical conversation fillers (e.g., "uh-huh," "hmm"), sound effects (e.g., "vroom-vroom"), generic attention-getting and social phrases (e.g., "hey," "here," "there you go"), and interjections (e.g., "yay," "wow," "oops"). More examples of coded variables are included in Table 2. Additional details and the coding manual are also available upon request.

Parental Language Input Dependent Variables

Four parent-level dependent variables (Table 3) representing quantity and quality of overall parental utterances and responses were derived from SALT transcriptions and coded variables. Quantity of overall parental utterances was measured by calculating the number of total parental utterances from the SALT transcriptions. Quality of overall parental utterances was measured by

Table 3. Definitions and Codes of Parent-Level Dependent Variables.

Dependent variables	Definitions and codes	Construct measured
Overall parental utterances	Number of total utterances from SALT transcriptions	Quantity of parental utterances
High-quality parental utterances	Number of parental utterances coded as topic-contingent and semantically rich	Quality of parental utterances
Rate of overall parental responses	Proportion of parental utterances coded as temporally contingent to child communicative acts	Quantity of parental responses
Rate of high-quality parental responses	Proportion of parental utterances coded as temporally contingent, topic-contingent, and semantically rich to child communicative acts	Quality of parental responses

Note. SALT = Systematic Analysis of Language Transcripts.

calculating the number of high-quality utterances. A parental utterance was considered high-quality if it was coded as both topic-contingent and semantically rich. Quantity of overall parental responses was measured by calculating the proportion of parental utterances coded as temporally contingent to child communicative acts. Parent responsiveness was measured using a proportion metric instead of a count metric to control for child communication rate as a parent only has the opportunity to respond after a child communicative act. Using a count metric would penalize responsive parents whose children rarely communicated. Finally, quality of parental responses was measured by calculating the proportion of high-quality parental utterances to child communicative acts. High-quality responses referred to parental utterances that were coded as temporally contingent, topically contingent, and semantically rich.

Reliability

Reliability was calculated by having a second coder independently recode 20% of the parent–child interactions for each group. Interobserver reliability was computed using intraclass correlation coefficients (ICCs), which reflects the proportion of the variability in the reliability sample that is due to among-participant variance in true score estimates of the behavior of interest (Shavelson & Webb, 1991; Yoder & Symons, 2010). ICC values were above .93 for all dependent variables except for rate of parental high-quality responses (ICC = .64). Based on Suen and Ary (1989), ICC values above .6 are considered acceptable.

Data Analysis

Preliminary analyses were conducted to rule out potential threats to internal validity. First, proportion variables were tested for violations of normality assumption using the Shapiro–Wilks's test. Results indicated that neither proportion variable violated normality ($p > .1$). Accordingly, original data were used without being arcsine transformed. Next, t tests and chi-square analyses were conducted for all demographic characteristics that are potentially associated with child- or parent-dependent variables to examine group equivalence. No significant differences were detected on child age, gender, race, or cognitive skills between groups ($p > .1$). However, though all mothers were high-school educated, a significant difference was detected in maternal education across the two groups: mothers in the TH group had higher levels of education than mothers in the HL group, $\chi^2(2) = 10.3$, $p = .006$. One-way analysis of variance (ANOVA) was then

Table 4. Summary Statistics and Between-Group Comparison of Parental Utterances and Responses.

Parental language input variables	HL group (n = 13)			TH group (n = 17)			HL vs. TH		
	M	*SD*	Range	*M*	*SD*	Range	*t*	*p*	Cohen's *d*
Overall parental utterances	129	43	38-200	179	41	118-276	3.31	.003**	1.19
High-quality utterances	35	20	1-68	57	26	23-105	2.61	.01*	0.96
Overall parental responses (%)	78	11	65-100	85	11	60-97	1.61	.12	0.59
High-quality responses (%)	14	10	0-29	36	17	14-66	4.25	<.001***	1.56

Note. HL = hearing loss; TH = typical hearing.
Obtained significance value: *$p < .05$. ***$p < .001$.

conducted to examine whether maternal education was independent of the dependent variables. No significant association was detected between maternal education and child CSBS-DP score or parental language input variables ($p > .05$). Due to the lack of association between maternal education and the dependent variables of interest, maternal education was not controlled for in the following analyses.

For the first two research questions, two-tailed independent *t* tests were conducted to test for differences in overall parental utterances, high-quality utterances, rate of overall responses, and rate of high-quality responses between the two groups. For the third research question that investigated the relationship between parental language input and early language skills and the extent to which this relationship was conditional upon child's hearing status, linear regression models were constructed for each parent-level-dependent variable to predict child CSBS-DP total raw scores (four regression models in total). Due to the limited sample size, separate linear regression models were used for each parental language input variable to preserve statistical power. For each model, the parent variable was entered first, the hearing group status was entered second as a dummy-coded variable, and the product term that represents the interaction between the parent variable and the group was entered last. Effect sizes were reported as Cohen's *d*.

Results

We predicted that significant differences would be detected in all four parental language input variables, favoring parents of children with TH. We further predicted that the relationship between parental language input and early language development would be conditional upon hearing status. In children with TH, early language development would be significantly predicted by parental language input, and this significant relationship between parental language input and early language development would be attenuated in the HL group.

Overall Parental Utterances and High-Quality Utterances

For the first research question, we compared parents' overall utterances and high-quality utterances across the two groups, as shown in Table 4. On average, parents of children with TH used 179 utterances (SD = 41) during 10 min parent–child interactions. Parents of children with HL used 129 utterances (SD = 43) on average. As predicted, both overall utterances and high-quality utterances differed significantly between the groups (Figure 1a and b), with parents of children with HL using fewer overall utterances, $t(28) = 3.31, p < .01$, Cohen's $d = 1.19$, and fewer high-quality utterances, $t(28) = 2.61, p = .01, d = 0.96$.

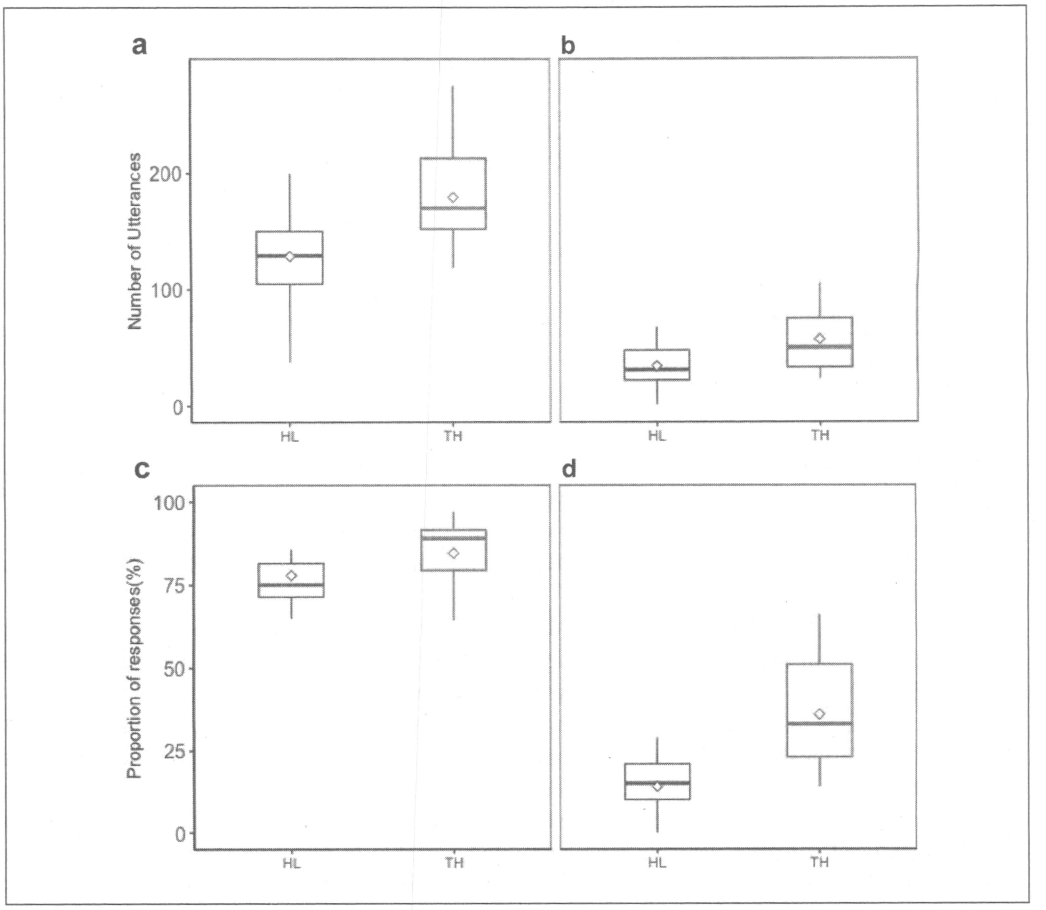

Figure 1. Boxplots displaying the number of overall parental utterances, the number of high-quality utterances, the rate of overall responses, and the rate of high-quality responses in the TH group and the HL group: (a) Overall parental utterances, (b) high-quality parental utterances, (c) proportion of overall responses, and (d) proportion of high-quality responses.

Note. Mean values were represented by diamonds; error bars represent ±1 standard deviation. TH = typical hearing; HL = hearing loss.

Rate of Overall Parental Responses and High-Quality Responses

For the second research question, we analyzed the rate of overall parental responses and the rate of high-quality responses across the two groups (Table 4). On average, parents of children with TH had an overall response rate of 85% (SD = 11%) and a high-quality response rate of 36% (SD = 17%). Parents of children with HL had an average overall response rate of 78% (SD = 11%) and a high-quality response rate of 14% (SD = 10%). A significant difference was found only in the rate of high-quality parental responses, $t(28) = 4.25$, $p < .01$, $d = 1.56$, but not in the rate of overall parental responses, $t(28) = 1.61$, $p = .12$, $d = 0.59$ (Figure 1c and d).

Relationship Between Parent Language Input and Early Language Development

For the third research question, we explored the relationship between parental language input and early language development and the extent to which this relationship was conditional upon the

Table 5. Regression Model Results for the Relations Between Parental Language Input Variables and Child CSBS Total Raw Score.

Models	*B*	*SE*	β	*t*	*p*	Adjusted R^2
Overall utterances	0.29	0.11	0.44	2.61	.01*	.17
High-quality utterances	0.80	0.18	0.65	4.50	<.001***	.40
Proportion of overall responses	66.98	50.68	0.24	1.32	.20	.03
Proportion of high-quality responses	129.70	23.12	0.73	5.61	<.001***	.51

Note. *B* = unstandardized coefficient; β = standardized coefficient; *t* = obtained *t* values.
Obtained significance value: *$p < .05$. ***$p < .001$.

hearing status of the child. No statistically significant interaction effect was detected between any parental language variables and hearing status when the product terms were included in the regression model ($p > .05$). Given the lack of parent language input variables × hearing status interaction, the two hearing groups were pooled for the next set of analyses.

Four parental language input variables were then respectively entered into separate regression models to predict child CSBS-DP total raw score. As shown in Table 5, significant main effects were detected for three out of the four parental language input variables: overall parental utterances ($p = .01$, adjusted $R^2 = .17$), high-quality utterances ($p < .001$, adjusted $R^2 = .40$), and the rate of high-quality parental responses ($p < .001$, adjusted $R^2 = .51$). The regression model for the rate of overall parental responses was not significant ($p = .2$, adjusted $R^2 = .03$).

Post Hoc Analyses

A new question emerged as we examined the findings. Given that parents of children with HL provided their child with comparably consistent overall responses but a significantly lower rate of high-quality responses compared to parents of children with TH, we conjectured that the quality of parental responses may be driven by the intelligibility of child communication. Although all parental responses were temporally contingent to a previous child communicative act, they did not necessarily contain meaningful linguistic content. When a child produces an ambiguous communicative act, it is more likely that the parent responds to such unclear utterances with conversation fillers or generic social phrases (e.g., "uh-huh," "okay then," "there you go!") to acknowledge the child's communication without fully understanding the child's intended meaning. Children with HL may have produced more unclear communicative acts than children with TH and thus elicited more generic adult responses without semantic content.

This hypothesis was tested post hoc in two steps. First, for each participant, a new proportion variable representing the intelligibility rate was created by summing the number of intelligible communicative acts (defined as communicative acts in which all words were transcribed) and dividing this sum by the total number of communicative acts. An arcsine transformation was conducted on the value of this percentage variable because it violated the normality assumption. A between-group independent *t* test was then conducted to examine whether children with HL produced a higher percentage of unintelligible communicative acts compared to children with TH. A significant difference was detected, with children with HL having a higher percentage of unintelligible communicative acts than children with TH, $t(27.956) = 2.96$, $p < .01$, $d = 1.05$ ($M_{HL} = 48\%$, $SD_{HL} = 29\%$; $M_{TH} = 24\%$, $SD_{TH} = 15\%$).

Next, a sequential analysis was conducted to test whether parents were more likely to use a high-quality utterance following an intelligible child communicative act versus an unintelligible communicative act. A sequential metric of association was selected over nonsequential metrics of association, such as Pearson's *r*, because the latter ignores the temporal sequence of two

Table 6. The 2 × 2 Contingency Table for the Calculation of Risk Difference Indices.

	Second event present (Y): Parental high-quality utterances	Second event absent (non-Y): Any coded events other than parental high-quality utterances
First event present (X): child intelligible communicative act	A X followed by Y	B: X followed by non-Y
First event absent (non-X): any coded event other than child intelligible communicative act	C Non-X followed by Y	D: Non-Y followed by non-X

Note. The risk difference index is calculated using this formula: RD = A/(A + B) – C(C + D). RD = risk difference index.

behaviors and can only indicate the extent to which two behaviors co-occur. To quantify the sequential associations, we used the risk difference (RD) index (Higgins & Green, 2011), also termed as operant contingency value (OCV; Martens, Gertz, Werder, Rymanowski, & Shankar, 2014). This index is defined as the difference between two conditional probabilities: the probability of a second event given the presence of a first event minus the probability of a second event given the absence of a first event. This sequential metric was selected because it has been shown to quantify contingencies between two behaviors while controlling for each behavior's base occurrence rate (Lloyd, Kennedy, & Yoder, 2013). Risk differences range from −1 to 1, with positive values indicating that a second behavior is more likely to occur given the presence of a first behavior and negative values indicating that a second behavior is less likely to occur given the presence of a first behavior.

In our analysis, the first event was an intelligible child communicative act and the second event was a parental high-quality utterance. The second event was a parental high-quality utterance instead of a high-quality response because the data have to meet the requirements of a 2 × 2 contingency table analysis; each behavior of interest must consist of mutually exclusive categories (child intelligible communicative act and parental high-quality utterance are either present or absent) and the two behaviors of interest must be coded independently of each other (Lloyd et al., 2013). Behavior pairs that represent the presence or absence of the first and the second behavior (four pairs in total) were tallied into the four cells of a 2 × 2 contingency table (see Table 6 for the 2 × 2 contingency table). An RD index was computed for each participant. A mean RD was then calculated for each group and the pooled group.

Results confirmed our post hoc hypothesis. The mean RD was 0.25 (SD = 0.30) for the HL group and 0.39 (SD = 0.20) for the TH group. The mean RD for the pooled group was 0.33 (SD = 0.25). One-sample t tests with each RD as the dependent variable revealed that all three means significantly differed from zero ($p < .01$, Cohen's d range from 0.93 to 1.95). An independent t test was conducted to test whether the positive sequence of parental high-quality utterances following intelligible communicative acts was stronger in the TH group compared to the HL group. No significant difference was detected between the two groups, $t(28) = 1.58$, $p = .13$. The positive RD indices for both groups and the pooled group indicate that parental high-quality utterances followed intelligible communicative acts more than expected by chance. The positive sequential association did not differ by group. In other words, our findings suggest that for both children with HL and children with TH, intelligible communicative acts were more likely to elicit high-quality utterances. Taken together, these results were consistent with our hypothesis that parents of children with HL may have provided a lower rate of high-quality responses because their children had more unintelligible communicative acts compared to the TH group.

Discussion

This purpose of this study was to examine parental language input to children with HL prior to receiving a CI. The first and second research questions assessed the extent to which the quantity and quality of parental utterances and responses directed to children with HL differed from those directed to children with TH. The third research question explored the relationship between parental language input and early language development in both groups. This study is unique in that it is the first study to examine parental language input to children with HL prior to implantation during the prelinguistic period of language development. Results indicate that children with HL were exposed to fewer overall utterances, fewer high-quality utterances, and a lower rate of high-quality responses. No interaction was detected between parental language input and hearing status. All parental input variables with the exception of overall responses were positively associated with early language skills measured by CSBS-DP total raw score in the pooled group. Post hoc analyses also indicate that the intelligibility of child communication influenced parents' use of high-quality utterances.

Quantity and Quality of Parental Utterances

Findings from this study support our hypothesis for the first research question. Parents of children with HL used significantly fewer overall utterances and fewer high-quality utterances compared to parents of children with TH. Interestingly, our findings on overall parental utterances contradicted findings from two previous studies (Ambrose et al., 2015; Vandam et al., 2012). Both of those studies examined the quantity of parental language input (as measured by the number of adult utterances and the number of adult words) and did not find significant differences between the HL group and the TH group. It is likely that the difference in findings was driven by methodological differences. Ambrose and colleagues (2015) used a 5-min structured task, the Art Gallery task (Quittner, Leibach, & Marciel, 2004), to elicit parental language input. In this task, five art pictures were mounted on the walls of the lab and parents were instructed to show the pictures to the child, talk about the pictures, and determine which picture the child likes the best and the least. In contrast, in our study, parental language input was sampled in a free-play context in the child's home. The differences in the level of structure of the task (structured vs. unstructured) and the location (lab vs. home) might explain the inconsistent evidence between this study and Ambrose et al. (2015).

In addition, Vandam and colleagues sampled the linguistic environment of children with HL using an automated technology, the Language Environment Analysis system (LENA™; Ford, Baer, Xu, Yapanel, & Gray, 2008). Full-day recordings of children's natural linguistic environment were automatically processed to yield the number of adult words. However, this automated software did not differentiate adult language directed to the child versus adult language directed to other communication partners. One possible explanation for these divergent findings is that children with HL may be exposed to comparable quantity of language input in their overall linguistic environment but significantly less quantity of adult language input directed to them. Taken together, these inconsistent results across studies highlight the impact that behavioral sampling context may have on dependent measures. Future research is needed to determine the extent to which parental language input varies based on communication tasks and to determine the best type of communication tasks to elicit the most representative samples.

Another interesting result was that parents of children with HL provided fewer high-quality utterances compared to parents of children with TH. This finding is in line with our prediction and findings from past studies that analyzed other aspects of quality of parental language input (Ambrose et al., 2015; DesJardin et al., 2014). For example, Ambrose et al. (2015) found that parents of children with HL used shorter utterances, fewer diverse vocabularies, fewer open-ended

conversation-eliciting utterances, and more directives. Parents of children with HL also used fewer higher level language facilitation strategies, such as expansions, recasts, and open-ended questions and more lower level strategies, such as labels, directives, imitations, and closed-ended questions (DesJardin et al., 2014). It has been proposed that the differences observed in quality of parental language may indicate that parents tailor their language input to their child's communication ability rather than to chronological age (Ambrose et al., 2015; Eddy, 1997). Our findings that parents of children with HL use fewer semantically rich and topically contingent utterances may reflect the same underlying phenomenon that parents of children with HL adapt and simplify their language input to facilitate language uptake of their child with limited receptive language abilities. DesJardin and colleagues (2014) also noted that parents of children with HL may intentionally use more lower level facilitative language strategies even when their child's language skills increase. While our study provided a baseline of quality of parental utterances in children with HL prior to implantation, it remains unknown whether parents would naturally demonstrate a shift to more complex and advanced language after their child receives a CI. Future studies are needed to understand potential changes in parental language input and interaction style toward children with HL following implantation.

Quantity and Quality of Parental Responses

A significant difference was detected in the rate of high-quality responses to child communicative acts but not in the rate of overall responses. The disparity observed in the rate of high-quality responses between groups was particularly striking. For children with TH, parents responded to child communication in a high-quality manner approximately one-third of the time (36%). In contrast, for children with HL, parents only responded with high-quality language input to one in seven child communicative acts (14%). Post hoc analyses revealed two exploratory findings. First, the positive sequential association between intelligible communicative acts from the child and parental high-quality utterances across both groups extends current evidence by demonstrating that the differences in the quality of parental responses were partly driven by characteristics of child communication. Specifically, parents were less likely to respond to unintelligible communicative acts with rich semantic content than to intelligible acts. For example, an unclear child communicative act such as a growl without a paired gesture would be more likely to elicit a generic noncontent response than a clear communicative act such as "ball" because it is more challenging to expand or recast a child's communication without understanding his or her intent. Taken together, while our findings converge with previous findings that children with HL were exposed to parental language input of poorer quality (Ambrose et al., 2015; Spencer, 1993), they further stress the importance of viewing parent–child interactions as a transactional system (Sameroff, 1975, 2009). The competence or outcome of the child should be considered as a function of intrinsic characteristics of the child (e.g., HL), stimulations from the child to the parent (e.g., unintelligible utterances), parent interpretations of the stimulation (e.g., unclear intention, reduced linguistic ability), parent reactions to the child (e.g., reduced complexity in parental language input), and further interchanges between the parent and the child (Sameroff & MacKenzie, 2003). Accordingly, interventions should consider all parts of the dynamic system within parent–child interactions.

Associations With Child Early Language Skills

For the third research question, it was hypothesized that the relationship between parental language input variables and early language development would be conditional upon hearing status. This hypothesis was not supported by the results. No significant interaction was detected between parental language input variables and hearing status. In one previous study (Smith & McMurray,

2018), the authors found that the influence of temporal properties of maternal responses on the child's response latency was moderated by hearing status. The authors suggested that HL may exert subtle effects on the interactions between children with HL and their mothers. Even though we did not detect an interaction between hearing status and parental language input, our findings are not incompatible with findings from Smith and McMurray (2018) but simply reflect different aspects of parent–child interactions. While Smith and McMurray showed that the coordination between children with HL and their parents may be less aligned than children with TH and their parents, our findings suggest that parental utterances and responses are positively associated with early language development regardless of hearing status.

When the two groups were pooled together to examine the relationship between parental language input and early language skills, results indicated that the number of overall parental utterances, the number of high-quality utterances, and the rate of high-quality responses were positively associated with children's early language skills. However, the rate of overall parental responses was not significantly associated with CSBS-DP scores. It is reasonable that parental responses which are irrelevant to child's communication or do not contain rich linguistic content may not be particularly helpful to young language learners with vulnerable linguistic systems. One previous study provided consistent evidence that parental language input which does not provide meaningful linguistic input was negatively associated with later language production ability in children with autism spectrum disorder (ASD; Haebig, McDuffie, & Weismer, 2013). For children with HL who have less verbal communication and attenuated access to parental language input, parental responses that are temporally contingent but do not include meaningful semantic content may be less facilitative of their language learning.

Limitations and Future Directions

The findings from this study should be considered in light of several limitations. First, considering the small sample size, parental language variables were added to multiple regression models separately to preserve statistical power. It remains unknown whether one aspect of parental language input is more effective than another. Considering our finding that the rate of high-quality parental responses but not the rate of overall parent responses is positively associated with early language development, future studies should investigate how these language facilitation strategies (i.e., parent utterances, temporally contingent responses, content-contingent responses, semantically rich responses) impact one another. Future work should also examine the extent to which the effects of various language facilitation strategies vary based on a child's developmental levels. In addition, due to limited resources and scope of this study, we were only able to code a 10-min parent–child interaction sample.

Another limitation was that our study did not collect data on the intensity or the type of support that parents received in early intervention. Although all children with HL included in the study engaged in a business-as-usual early intervention program, parents in the study did not receive systematic parent training that targeted aspects of parental language input examined in this study. Despite this limitation, our findings that parents of children with HL used fewer high-quality utterances and less consistent high-quality responses suggest that parents may need additional support beyond business-as-usual early intervention services to better support their child's early language development. A further limitation is that even though all children were CI candidates who were using bilateral hearing aids at the time of data collection, this study did not have a measure of hearing aid use during the day. Given that children's access to spoken language communication could potentially impact parental communicative behaviors, future studies should look at how consistency of hearing aids use, access to spoken language communication, and severity of HL impact quantity and quality of parental language input. Finally, the concurrent intact group design and concurrent correlation design were not sufficient to examine the directionality of the relationship

between parental language input and early language development. Future studies should follow language development of children with HL longitudinally to examine the extent to which differences observed in parental language input between the TD and HL groups persist following CI implantation.

Implications for Practice

What should parents do when they are uncertain of the nature of their child's intention of communication during an interaction? One adaptive strategy is to pay close attention to their child's focus of attention to be better detectives of their child's possible communicative intent. Parental responses in this study were limited to the responses that follow a child's communicative act. However, there is mounting evidence that parental responses to a child's focus of attention also facilitate language learning in both typical and atypical populations (McDuffie & Yoder, 2010; Siller & Sigman, 2008). Parental utterances following the focus of attention have been found to account for unique variances in predicting spoken vocabulary gain in children with ASD (McDuffie & Yoder, 2010) and in children with Fragile X Syndrome (Brady, Warren, Fleming, Keller, & Sterling, 2014). In addition, multiple intervention studies have demonstrated that parent responsiveness is a malleable factor in intervention (Girolametto, 1988; Venker, McDuffie, Weismer, & Abbeduto, 2012). Parents were able to describe their child's focus of attention and interpret their child's communicative act following a parent-mediated intervention training that incorporated both parent education and hands-on coaching (Venker et al., 2012). A meta-analysis of parent-implemented language interventions also showed that parents of children with language impairments learned to be more responsive than parents who were not trained (Roberts & Kaiser, 2011). When receiving an unclear utterance from the child, the parent could respond to their child's focus of attention, describe an object of joint attention, or narrate an activity in which the child is engaged. Future studies may investigate whether parents naturally use any communication repair strategies when encountering unintelligible utterances and the extent to which follow-in comments as an adaptive strategy are empirically effective for children with HL.

In addition, professionals may want to share findings and implications from our study with families with children with HL. Quite strikingly, parents of children with HL are not typically provided with empirically based strategies for communicating with their child and facilitating their child's language development during the preimplantation period (Kelly, 2013). It is important that professionals encourage and coach parents to not simply focus on the amount of input provided to children with HL but also to provide high-quality input that includes rich semantic content.

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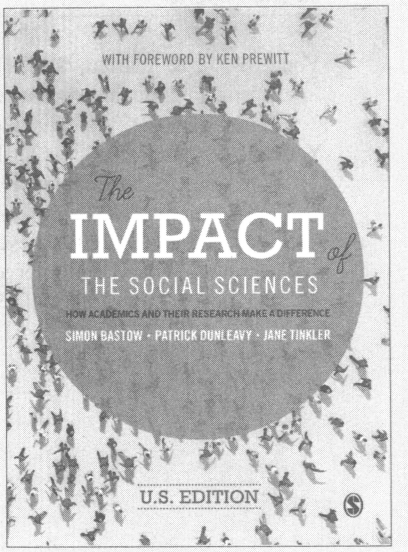
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HOW ACADEMICS AND THEIR RESEARCH MAKE A DIFFERENCE
SIMON BASTOW • PATRICK DUNLEAVY • JANE TINKLER
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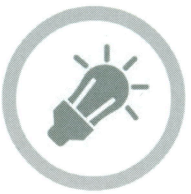

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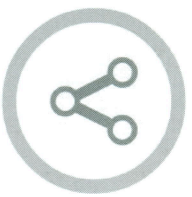

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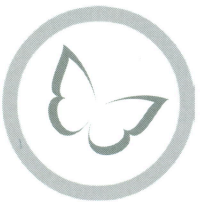

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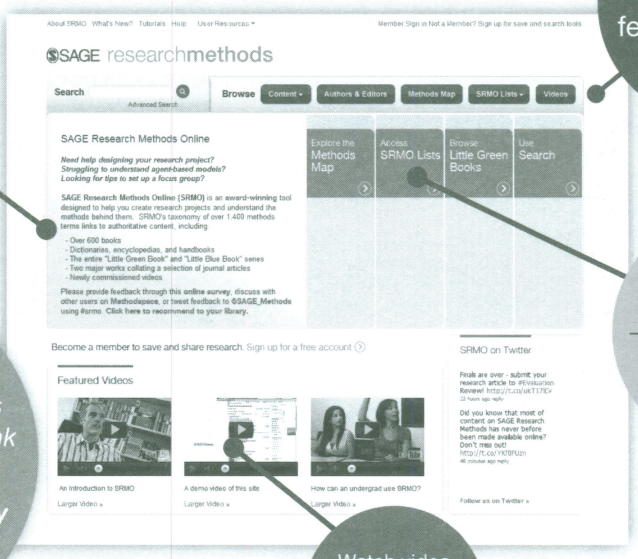

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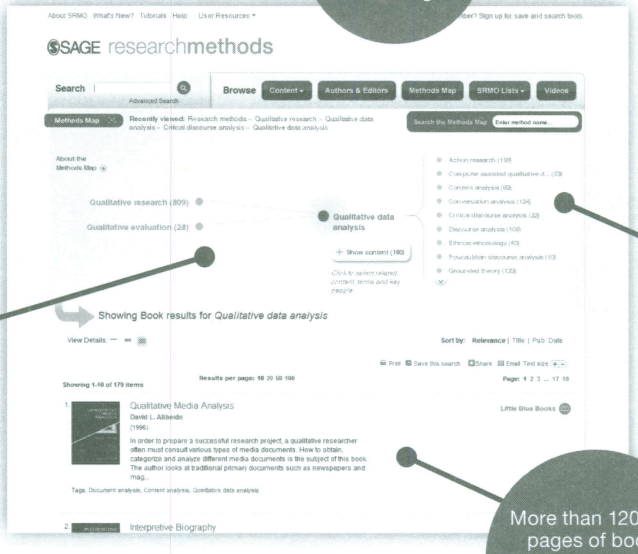

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